IPAD system knowledge summary

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Chapter 1 Summary of Commonly Used English

In the daily production, testing and maintenance process of Apple IPAD series products, you will encounter many British

Chinese words. These words are widely distributed in material principle introduction literature, product testing software and daily production

Under property management. Learning and mastering these words will not only help relevant colleagues have a deeper understanding of the IPAD series

products, improve daily work efficiency, and enable engineering and technical personnel to read English technical information to further

Learning electronic knowledge can help. This chapter is mainly divided into three parts to describe the structure and functions of the IPAD series products.

Improve the English abbreviations of design, testing and production management, and combine them with relevant information and own understanding.

It has been translated into Chinese. Due to limited abilities, some English and standard translations may deviate. We hope that

Choose the good and follow it. I hope the following content will be helpful to colleagues in their daily work and study.

1.1. Machine structure and function categories. The following is the structure of **J2&J2A** machine. This section combines the appearance structure of the machine to

Common English descriptions of machine structure and functions are provided.

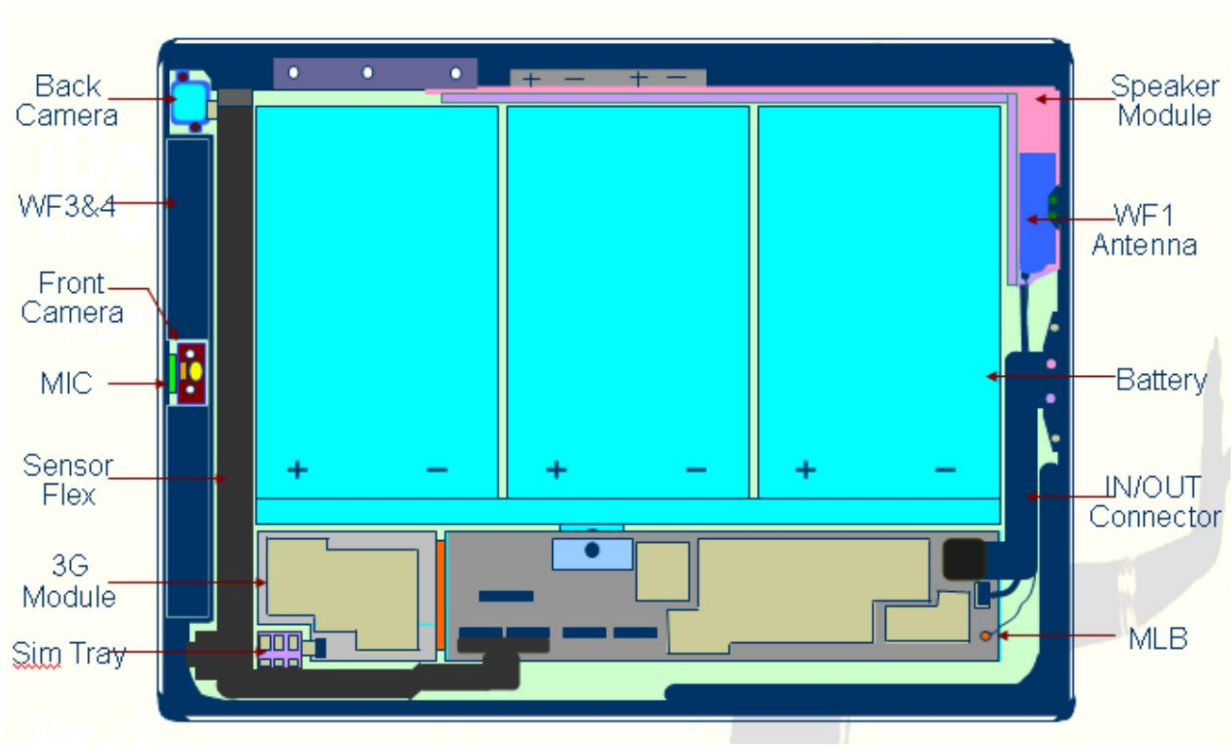


Figure 1-1. Component structure of JX series products

HSG: Housing bottom cover Grape: Touch Panel touch screen

SPK:: speaker LCD: Liquid Crystal Display

MIC: Microphone microphone I/O:: Input/Output Interface input and output interface

3G: The third Generation Communication Module The third generation mobile communication processing module

MLB: Main Logic Board Main Logic Board Power /Hold Button: Power button

Back/Rear Camera: rear camera Antenna: antenna Magnet: magnet

Volume Down Button Volume Down Button Sensor Board: Sensor Board

Volume up Button Volume up button Mute Button SIM Card: SIM card

SIM Tray: SIM card tray Menu Button: Menu key Battery: Battery

Front Camera: Front camera HP: Headphone TB: Trim bead

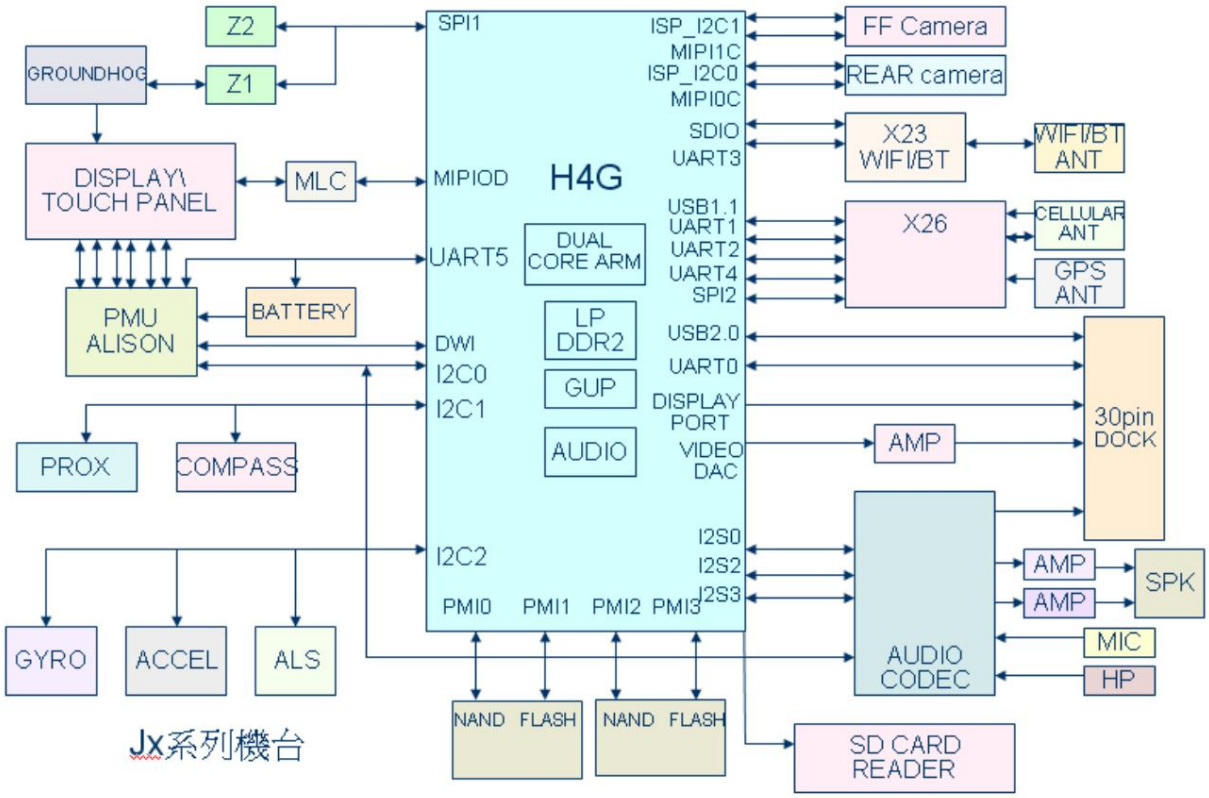


Figure 1-2. Structure of each module of JX series products

WIFI: Wireless Fidelity Wireless High Fidelity BT: Bluetooth Bluetooth

ARM: Advanced Reduced Instruction Set Computer Machines embedded microprocessor

EEPROMÿElectrically Erasable Programmable Read Only Memory

Electrically erasable programmable read-only memory. Battery Cycle Count: Number of battery cycles

WLAN: Wireless Local Network Wireless LAN Cellular: Cellular mobile communications

GPS: Global Position System Global Positioning System AMP: Amplifier amplifier

AUDIO CODEC: Audio Code/Decode Chip audio encoding/decoding chip

VIDEO: video NAND FLASH: flash memory

UARTÿUniversal Asynchronous Receiver & Transmitter

Universal asynchronous receiving/transmitting device CPU: Center Process Unit central processing unit

SD CARD: Secure Digital Memory Card secure data storage card

DAC: Digital Analog Converter digital analog signal converter

I2C: Inter Integrated Circuit Intel Integrated Electronic Circuit

I2S: Inter Integrated Circuit Sound Intel integrated audio electronic circuit

USB: Universal Serial Bus Universal Serial Bus Display Port display port

PMU: Power Management Unit power management unit

SPIÿSerial Peripheral Interface

DDRÿDouble Data Rate Synchronous Dynamic Random Memory

Double rate synchronous dynamic memory. MPU: Micro Process Unit microprocessor

GPU: Graphic Process Unit Graphics and Image Processing Unit Poly Switch: Current limiting switch

Gyro: Gyroscope Accel.: Accelerometer

ALS: Ambient Light Sensor Light Sensor Compass: Compass

Prox.: Proximity proximity sensor Hall Sensor: Hall sensor

GSM: Global System for Mobile Communication Global System for Mobile Communication

UMTS: Universal Mobile Telecommunications System Universal Mobile Telecommunications System

LTE: UMTS Long Term Evolution, the long-term solution for the third generation mobile communication system

CDMA2000: Code Division Multiple Access code division multiple access technology

3G: The Third Generation Telecommunication third generation mobile communication system

4G: The Forth Generation Telecommunication fourth generation mobile communication system

1.2. Design and test engineering category. This section mainly lists the name of the test station and the internal coding of the test software of each station.

A brief summary of the abbreviations of codes used in the process is introduced.

QT0: Quick Test 0 Quick Test 0 SW/DL: Software Download software download

Pre-SW/DL: Pre Software Download

Connectivity: Connectivity test Burn In: Burn-in test

PAT: Passive Antenna Test Passive test OTA: Over The Air active test

AIM: Auto Gap/Offset Inspection Machine gap/offset automatic inspection equipment

IMU: Inertial Measure Test Inertial Test Unit HW: Hardware Hardware

MUAV: Multi-Audio and Video Test audio and video test

FACT: Final Acoustic Test Grape Calibration: Touch screen calibration

Hall Effect Sensor: Hall chip induction test Magnet Spin: Strong magnetic field test

Magnet Flap: weak magnetic field test MMI: Man Machine Interface human-machine interface test

LCD Uniformity: Liquid Crystal Display Uniformity LCD display uniformity test

Proximity Susceptibility: Proximity sensor sensitivity test

Gate Keeper: Gate Control Test Shipping Setting Factory Setting

SN: Serial Number Machine serial number ID: identity Identification code

SFC: Shop Floor Control production control system FW: Firmware firmware

PDCA: Product Data Collection And Analysis production data collection and analysis system

PTS: Production Tracking System Product Tracking System CB: Control Bit control bit

WO: Work Order work order number AP_CHIPID: Apple Chip Identity processor ID number

Reg.: Region country number MPN: Manufacture Part Number manufacturer part number

DP: Display Port Display Port Ext. MIC: Exterior MIC External (on the headset) microphone

Int. MIC: Internal Microphone Internal (on-machine) microphone

HSIC: High Speed Integrity Chip

NTC: Negative Temperature Coefficient Negative temperature coefficient (battery)

FCC: Full Charge Capacity Battery saturation capacity Component: component/component

Humidity: Humidity Temperature: Temperature BER: Bit Error Rate bit error rate

FR: Frequency Response frequency response RB: Rub &Buzz noise parameters

THD: Total Harmonic Distortion Sealed: Sealed

EDP: Electronic Display Port Electronic Display Port Configuration: Configuration

CFB: Capacitance Free-back capacitor feedback value Back Light backlight

CH_0: Channel 0 Channel 0 (receiving infrared and visible light) CH_1: receiving infrared light

LCM: Liquid Crystal Module Liquid Crystal Module Light Leakage: Light leakage

TFT: Thin Film Transistor Thin Film Transistor Bright Dot: Highlights

LVDS: Low Voltage Differential Signaling Low Voltage Differential Signaling

COG: Chip On Glass fixes the chip on the glass Black Dot: black dot

VGA: Video Graphic Array, Abnormal Display, Abnormal Display

PCB: Printed Circuit Board Printed Circuit Board TX: Transmit Power

LED: Light Emitting Diode CG: Cover Glass

AR: Anti Reflection Glass (CG surface and AR surface are on the upper and lower sides of the touch screen respectively)

EVM: Error Vector Magnitude Error Vector Magnitude Frequency Error Frequency Error

ERP: Effective Radiated Power Effective Radiated Power Phase Error Phase Error

FDMA: Frequency Division Multiple Access frequency division multiple access technology

TDMA: Time Division Multiple Access time division multiple access technology

CDMA: Code Division Multiple Access code division multiple access technology

Voltage: voltage Current: Current Power: Power Resistance

Multi-Meter: Multimeter Fixture: Fixture Blemish: Dirty Fiber: Wool fiber

MTF: Modulate Transfer Function Optical: Optical

Capacitance: capacitance Inductance: inductance Vendor: manufacturer

Diode: diode TTL: Transistor-Transistor Logic

Rotation: Deflection Tilt: Tilt Shift: Offset Gas Gauge: Power management circuit

Interference: Interference OS: Operation System operating system

RMS: Root Mean Square ITO: Indium Tin Oxides

RSSI: Received Signal Strength Indication

In-circuit test: online test OCA: Optically Clear Adhesive optically clear adhesive

GPIB: General Purpose Interface Bus General Purpose Interface Bus Impedance: Impedance

AOI: Automatic optical inspection Accessory: Accessory

Component Damaged: The component is damaged Schematic: Schematic diagram

EMC: Electromagnetic Compatibility Tombstone: (component) tombstone

DFU: Development Firmware Upgrade firmware forced upgrade mode

FCT: Function Control Test Function Control TestAppendix: Appendix

SOC: System On a Chip CMD: Command test command

VTHÿVolume Score/Volume Threshold LCRÿLocal Contrast Region

1.3. Production and maintenance management. This section mainly discusses common English abbreviations and common usage in daily production and maintenance processes.

A brief summary of terminology.

RD: Research & Design EE: Electronic Engineer Electronic Engineering

ME: Mechanic Engineer Structural Engineering RF: Radio Frequency Radio Frequency Engineering

SW: Software Engineer TE: Test Engineer Test Engineering

IE: Industry Engineer Industrial Engineering IT: Information Technology Information Engineering

QA: Quality Assurance QC: Quality Control

OQC: Outgoing Quality Control No Solder

IQC: Incoming Quality Control Adapter: converter

FA: Failure Analysis RE: Repair Engineer Repair Engineering

MFG: Manufacturing Group Product Manufacturing PD: Product Design Product Design

IPQC: In Process Quality Control production process quality control

FATP: Final Assembly Test Package Out Final assembly, testing, packaging.

Retest: retest Reflow: Reflow Reseat: reassemble

Rework: Rework Replace: replace Reset: restart/reset

UPH: Unit Per Hour WI: Work Instruction

UPPH: Unit Personal Per Hour Stiffener: Border

SOP: Standard Operation Procedure Model: Machine type

BOM: Bill Of Material Reassembly: Reassembly

Lot Number: batch number Part Number: material number NGÿNot Good

NTF: No Trouble Found WIP: Work In Process

SWR: Special Work Request CR: Control Run

COF: Continue On Failure UUT: Unit Under Test test machine

Interface: Interface Connecter: Connector Screw: Screw

Foam: Foam Mylar: Mylar Screw Driver: Screwdriver Line: Line body

ACF: Anisotropic Conductive Film (X, Y axis insulation, Z axis conductive)

NPI: New Production Introduction FB: Finish Goods

DVT: Design Validation Test Design Feasibility Verification Defect: Defect

EVT: Engineering Validation Test Engineering Feasibility Verification Report: report, report

PVT: Product Validation Test Product Feasibility Verification Station: Work station

SMT: Surface Mounting Technology Fixture: Fixture

SMC: Surface Mounting Component surface mount parts

CRBÿCustomer Return Board Returned goods CAÿCustomer Audit Customer inspection

RRT: Rolling Reliability Test Stability Test Tip-Top: Account Management System

EMC: Electromagnetic Compatibility electromagnetic compatibility

EMI: Electromagnetic Interference Electromagnetic Interference Color Filter: Filter

ERP: Enterprise Resource Planning Enterprise Resource Planning Log: record

Total Quality Management Mass Production: mass production

MRP: Material Requirement Planning

PM: Project Management QE: Quality Engineering Quality Engineering

ESD: Electrostatic Discharge Electrostatic Protection IP: Internet Protocol Internet Protocol

3GPP: Third Generation Partnership Project third generation mobile communications cooperation project

GPRS: General Packet Radio Service General Packet Radio Service

HTTP: Hyper Text Transport Protocol Hypertext Transfer Protocol

TCP: Transmission Control Protocol Transmission Control Protocol

SER: Social Environmental Responsibility Social Environmental Responsibility

EICC: Electronic Industry Code of Conduct Electronic Industry Code of Conduct

NVM: Nonvolatible Memory

Chapter 2 Introduction to **IPAD** series products

This chapter will briefly introduce several generations of Apple's **IPAD** series products, and analyze the three types of products that have appeared so far.

The modern products are briefly compared and explained from the aspects of overall function, structural design, chip function, etc.

2.1. Overview of IPAD series products.

Apple's first generation tablet computer was launched on April 3, 2010, and was divided into two types: K48 and K48M

model. Compared with the K48 machine, the K48M machine mainly adds mobile communication functions. From a structural point of view

Said that it mainly adds 3G module, Proximity and SIM card slot, and the antenna AP3 is integrated in TILT

on, connected to the 3G module through a transmission line. The rest is the same as K48.

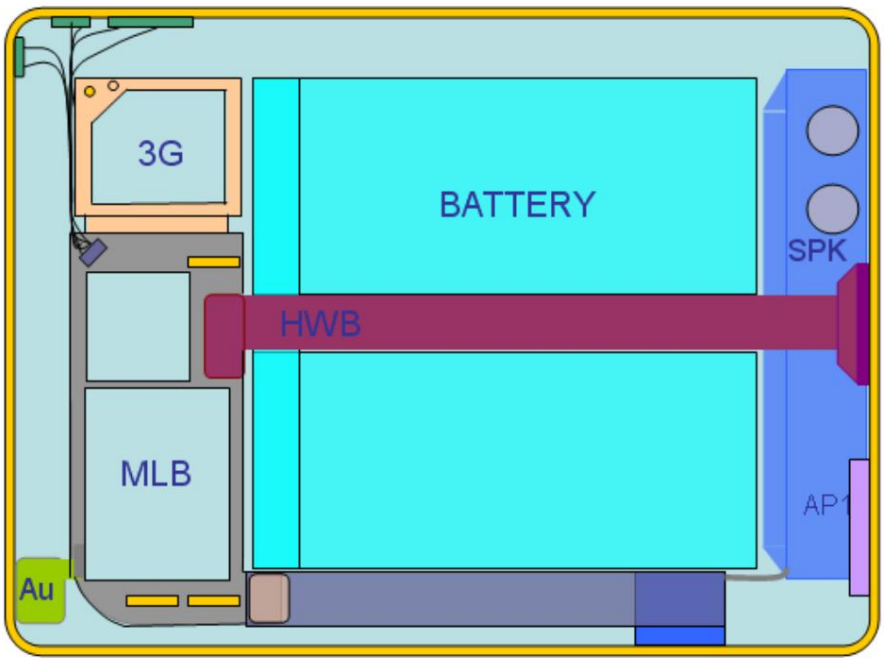


Figure 2-1, K48 series machine under-table component structure

The above is the structure diagram of K48M machine HSG, Bluetooth, wireless LAN and GPS module (signal

processing module) integrated on the back of the HWB. The receiving and transmitting antenna of BT and WIFI is called AP1, designed

Next to the SPK; the GPS receiving antenna is designed in the very center of the HGS (under the battery and HWB). audio mode

Groups include SPK, HP, MIC. The SPK is placed at the front of the HSG, and its sound hole is designed on the side of the HSG.

MIC and HP are integrated together and connected to MLB through flexible cables. All other chips and functional modules are integrated

In MLB.

For the upper component, the K48 series product touch screen (Grape) and LCD (Liquid Crystal Display) are combined

together, called TILT. The upper and lower components are tightly fastened together through iron spring pieces.

Apple's second-generation tablet computer was launched on March 4, 2011, commonly known as the K9X series. due to out

Depending on the country of delivery, there are three models: K93, K94, and K95. The corners of the bottom cover of K9X series products are rounded

Arc type, adding front and rear cameras for video communication and taking photos, will officially be responsible for data signals

The processing motherboard is separated from the sensor chip responsible for sensing external environmental signals and processing data. K94,

Compared with K93, K95 mainly adds mobile communication functions, as well as 3G modules and

Antenna, proximity sensor chip and antenna WF4 that adjusts the transmit power of radio frequency signals.

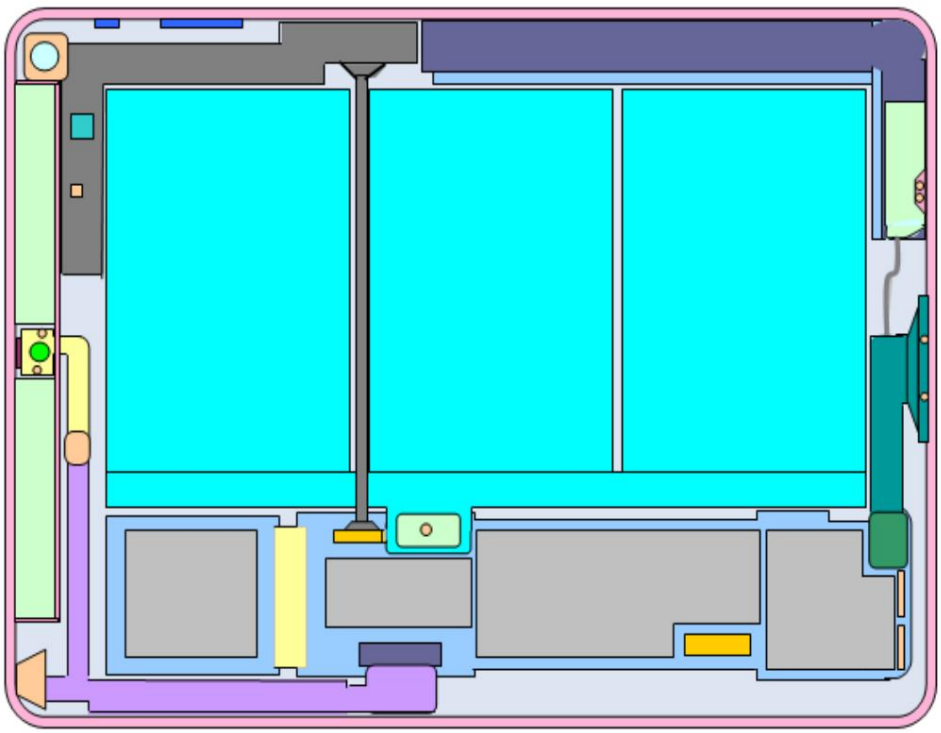


Figure 2-2, K9X series machine under-the-counter component structure

In K9X products, the motherboard mainly integrates the central processing unit (CPU), and the image processing unit Yuan (GPU), audio processing module (AUDIO CODEC) and memory (Memory), etc., it It is connected to the 3G module responsible for mobile communication signal processing through anisotropic conductive glue (ACF). Induction board Integrated accelerometer, gyroscope and compass and proximity sensors (Proximity). The two are connected through induction lines. At the same time, the rear camera, The data and key signals sensed by the chip on the Hall Sensor are sent to the motherboard through the sensor board and sensor cable. transmission. In terms of audio modules, the K9X series products use a corner-type SPK with a larger sound cavity and a sound hole. Designed on the bottom of the HSG, it significantly enhances the sound effect of the product. And separate MIC and HP, MIC Using a MEMS condenser microphone and pasting it on the edge of the HSG saves space, but also adds more space to the group. Pretending to bring a lot of trouble. In the K9X series of products, the front camera (Front Camera), microphone The data transmission between (MIC), headset (HP) and SIM card (K94 model) and the motherboard all rely on processing. Canada Flex is completed. See picture above.

Compared with the K48 series products, in the K9X series products, the touch screen (Grape) and liquid The crystal display screen (LCD) is also separated. The display is fixed to the HSG with four screws, while the touch The screen is glued to the HSG.

Apple's third-generation tablet was launched on March 8, 2012. IPAD3 depends on the country of shipment. Different mobile communication standards are used, and it is divided into three models: J1, J2 and J2A. IPAD3 in terms of appearance design Basically the same as IPAD2. The internal structure has been changed to reduce the tendency of IPAD2 to appear in production. process issues and functional enhancements. See below.

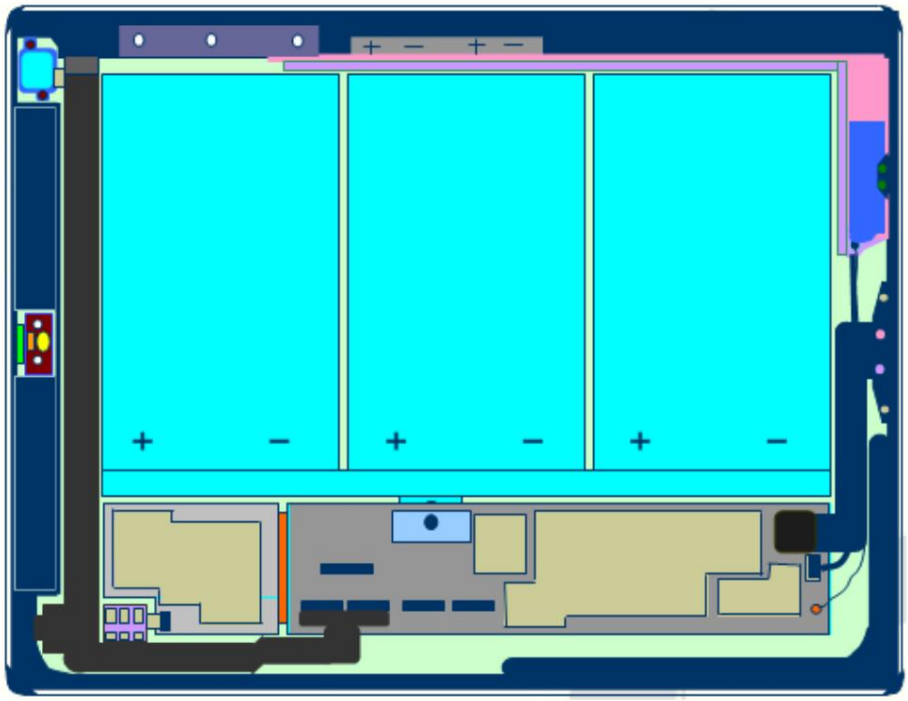


Figure 2-3, JX series machine under-table component structure

The IPAD3 series product motherboard uses double-sided SMD, and the ACF between the motherboard and the 3G module

The cable is designed at the bottom of the motherboard. The motherboard is completely fixed with screws, which reduces the difficulty of disassembling the machine (on K9X

There is adhesive on the back of HSG and the motherboard), which also overcomes the manufacturing process at both ends of the ACF connection; the sensing line is removed,

Integrate the sensor board connection cable and Canada Flex cable on the K9X series products into one,

Reduces the impact of the pressure of the sensing line on the LCD screen display; increases the strength of the button wiring, and

Covering iron sheets greatly avoids process problems during the production process. IPAD3 connect the SIM card and

Canada Flex is completely separate, and the SIM card is directly connected to the 3G module. In addition, the IPAD3 machine also adds

Added 4G mobile communication function. See subsequent chapters for detailed introduction.

2.2. IPAD series product configuration parameters.

As technology continues to innovate, major manufacturers are competing to launch tablet computer products. Likewise, Apple Inc.

We are also constantly innovating, optimizing appearance design, enhancing product functions, and improving machine performance to

Cater to market demand. The following are the configuration parameters of the IPAD series announced by Apple to the outside world.

Main configuration parameters of **IPAD** machine			
project	K48 Series	K9X Series	JX Series
size	9.7 inches	9.7 inches	9.7 inches
Volume	242.8*189.7*13.4	241.2*185.7*8.8	241.2*185.7*9.4
Resolution	1024*768	1024*768	2048*1536
Weight	680g (WIFI) / 730g (3G)	601g (WIFI) / 607g (3G)	652g (WIFI) / 662g (3G)
Capacity	16GB/32GB/64GB	16GB/32GB/64GB	16GB/32GB/64GB
Processor	A4 clocked at 1GHZ	A5 main frequency 1GHZ	A5X main frequency 1GHZ
RAM	256MB	512MB	512MB
Screen	IPS multi-touch capacitive screen	IPS multi-touch capacitive screen	IPS multi-touch capacitive screen
wireless	WIFI/BT/3G	WIFI/BT/3G	WIFI/BT/3G/4G
3G Standard	WCDMA	WCDMA/CDMA2000	WCDMA/CDMA2000
Pre-installed system	iOS 3.13	iOS 4.3	iOS 5.1
Camera	none	Front 30W, rear 70W	Front 30W, rear 500W
battery capacity	/	25Wh	44.5 Wh
10 hours of battery life, 10 hours of standby for 1 month		10 hours of standby for 1 month	1 month of standby

2.3. Introduction to the main components and functions of IPAD

As an embedded microprocessing system, IPAD cannot realize its overall function without each function.

chip. As we all know, the von Neumann system computer consists of arithmetic unit, controller, memory, input

Equipment and output devices are composed of five parts. Each part passes through the data bus, control bus, and address bus.

connected to form a complete system. Similarly, Apple IPAD also follows this architecture, as follows

Taking the JX series machine as an example, we will briefly introduce the functions of common modules and related buses in IPAD.

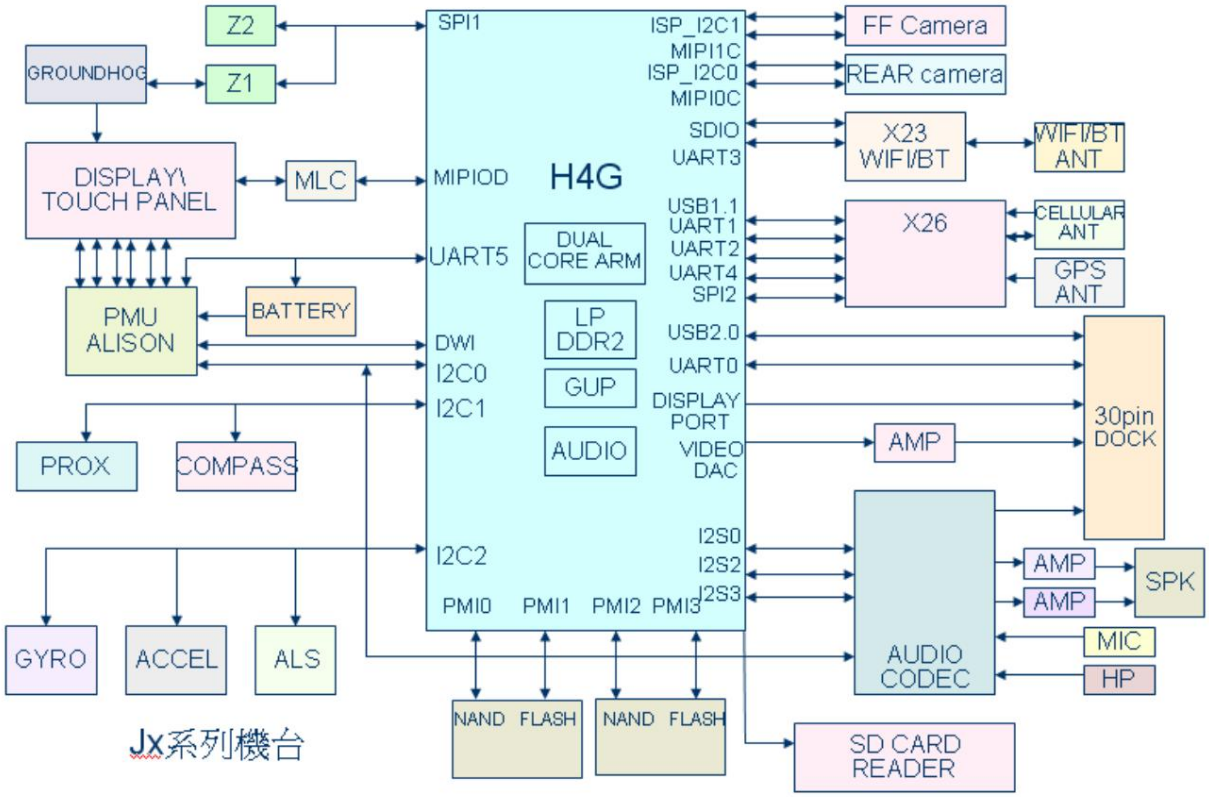


Figure 2-4. Connection diagram of main modules in JX series products

1. Touch screen (GRAPE)

System input device, IPAD series products use IPS multi-touch capacitive touch screen, through

Touch the relevant icons of the human-machine interface with your fingers to control the system to respond accordingly (such as taking pictures, playing music,

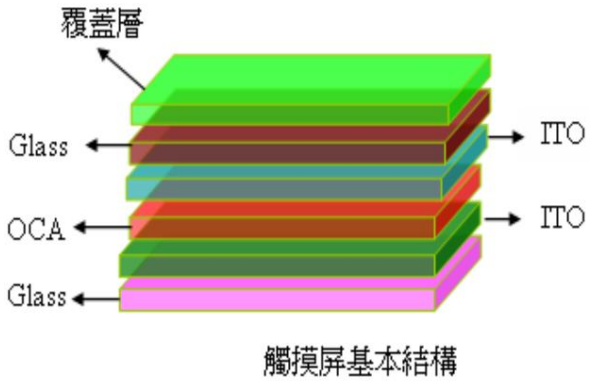
phone calls, etc.). Capacitive touch screen uses indium tin

The oxide layer serves as its working layer. in working layer

There are cover glasses (Cover Glass) on the top and bottom.

On the lower surface, in order to reduce the glass's exposure to LCD light

reflection, the glass screen is usually coated with a transparent layer



觸摸屏基本結構

Bright anti-reflection film (Anti-Reflection Film). Capacitive touch screens have a narrow plate around the panel

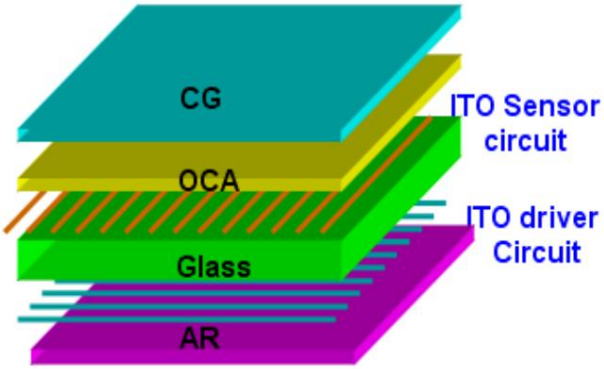
The motor forms a low-voltage AC electric field in the conductive body. When the user touches it, due to the electric field of the human body,

A coupling capacitance is formed between the finger and the conductor layer. Then, the current from the four side electrodes will flow to the contact

point, its strength is proportional to the distance between the finger and the electrode. The controller calculates the proportion and strength of the current,

The position of the contact can be accurately calculated.

Capacitive touch screens are divided into surface capacitive



Touch screen and projected capacitive touch screen. project electricity

Capacitive touch screens utilize one or more etched

ITO mould board (DITO: Double ITO)

The additive arrays exist in different planes and are mutually exclusive at the same time.

It is composed of vertical transparent wires that form driving lines similar to the X and Y axes. These wires are made of electricity

Capacitance sensing chip control, when current drives the wires through the driving line, and detects changes in capacitance value

The wires are connected, and the control chip sequentially downloads the detected capacitance value change data to the main controller. In the system

After confirming the contact position, since the transparent wire has already formed a three-dimensional electric field on the panel, the close measurement of the contact

Sensing can occur without touching the screen. This technology can also be used for Z-axis sensing resolution applications. project electricity

The touch screen supports multi-finger touch recognition.

Affected by electronic noise such as display, backlight, static electricity, electromagnetic fields and assembly matching, the touch screen

Corresponding charge drift will occur. Therefore, the touch screen needs to be calibrated once before use to ensure that the touch screen is consistent with the system.

System matching to achieve a balanced state.

2. Display screen (LCD)

The LCD monitor realizes graphic image display by controlling the luminous flux of external light through liquid crystal steering.

When the light generated from the backlight passes through the liquid crystal molecules, the liquid crystal molecules are arranged in a twisted shape.

In different states, the amount of light passing through is different, thereby achieving changes in screen brightness and darkness, and then reproducing images.

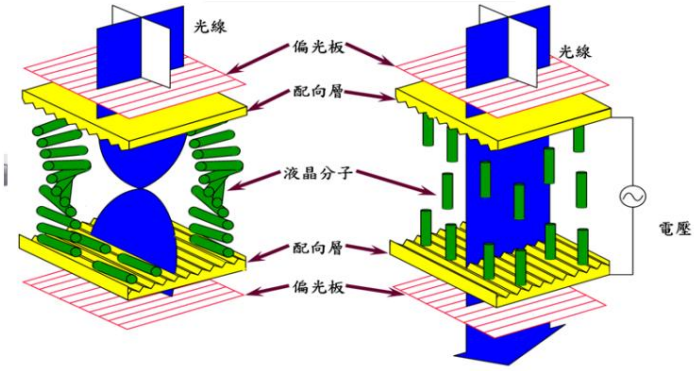
The twist size of liquid crystal molecules is determined by the voltage applied to the polarizers at both ends of the liquid crystal molecules. electricity

Different pressures lead to different degrees of liquid crystal distortion.

The amount of light passing through the liquid crystal is different, so it can

Realize the conversion of electricity into light. i.e. through voltage

Changes control the luminous flux of the liquid crystal, thereby converting the electricity



The signal is converted into luminous flux. In other words, whether the LCD displays or not depends on whether the pixel electrode is added

Voltage; the brightness or darkness of the LCD screen depends on the strength of the voltage signal. And the voltage signal is

It is emitted by the main control chip on MLB and is not affected by the LCD. So all the LCD can do is communicate

By controlling the on and off of its internal TFT (thin film transistor) switch, the signal transmitted from MLB is determined.

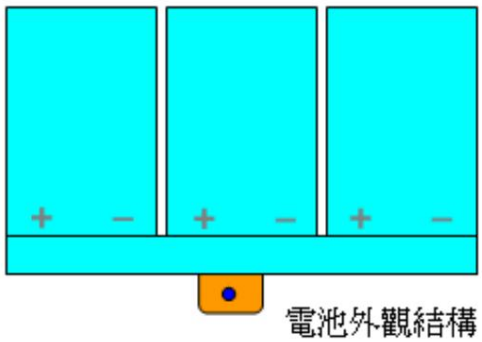
Whether the voltage signal can be added to the pixel electrode to control the LCD display.

3. Battery

Electronic system power supply module, IPAD series products

Using polymer lithium-ion rechargeable battery (Li-Polymer)

Provide power to the system. Polymer lithium-ion battery is a kind of



A high-energy-density battery made of lithium ions, which usually uses polymers as the positive electrode; solid

State, colloidal polymer or organic electrolyte as electrolyte. It is the same size as NiCd batteries, NiMH

Compared with batteries, it has the largest power reserve, lightest weight, longest life, shortest charging time, and no memory.

memory effect. In batteries, energy management circuits (Gas Gauge) are usually used as the interface between the battery and the motherboard.

A bridge of communication. At the same time, the battery usage is monitored. In addition, a thermal

Resistor (used to test battery NTC, as charging and discharging parameters), temperature switch (Thermostat: used to

Detect battery pack temperature and serve as a forced protection switch for battery abnormality), current limiting switch (Poly Switch:

For battery and temperature overload protection), thermal fuse (battery final protection mechanism, if the battery continues to abnormal

Normally, the temperature is too high or the current is too large, the fuse blows, the battery stops working), etc. as its protection mechanism.

Manage battery operation. The electrochemical reaction equation of lithium ion charge and discharge is as follows:

$$LiCoMO_2 + Cn \underset{\text{discharge}}{\overset{\text{charge}}{\rightleftharpoons}} Li\text{-}xCoMO_2 + CnLix$$

Since lithium has one electron in the outermost layer, its chemical properties are quite active and can be easily lost or gained.

One electron saturates the number of electrons in the outermost shell, so it can be used as an energy storage material. Lithium ion charge

Batteries are easily affected by temperature, current, and voltage. Relative to temperature, in ion rechargeable batteries,

The electrolyte is close to a solid state at -20°C, and its ability to conduct electrons is very weak. Higher temperatures can make its performance more active.

splash to obtain better charge and discharge performance. However, the electrolyte begins to evaporate at 60°C and begins to boil at 90°C.

Therefore, the working condition of the power supply must be controlled through temperature detection feedback. Relative to voltage, when the battery is

When the voltage is too high, lithium ions and oxygen are precipitated. Since the reaction is irreversible, it is easy to cause the battery to swell. Overvoltage

When low, lithium ions are stably combined with carbon elements or form stable lithium metal, thereby forming a barrier inside the battery.

Resistance causes battery capacity to decrease. Relative to current, when the charging current is greater than the chemical reaction speed, more

The residual energy will be converted into heat energy, causing the battery to thermally expand; when the discharge current is too large, it is easy to cause internal

Voltage is too low or local overheating.

4. Main Board (MLB)

processed as system information

JX機台主板結構圖

Core components, the motherboard mainly integrates the central processing unit (CPU) and graphics processing unit (GPU).

Power management unit (PMU), audio codec unit (AUDIO CODEC), memory

(NAND&NOR) and other chips. Under the premise of the clock signal provided by the crystal oscillator, the processor follows the program

Sequence control, the data stored in the memory or the data input from peripherals (touch screen, microphone, etc.)

The signal is processed accordingly, and then the processed signal is output. The following will introduce the main chips in the motherboard

Give a brief introduction.

(1), Power management unit (U8100): outputs power to the battery in the system

Manage the power supply and provide power for the normal operation of each component in the machine.

(2) Main processing chip (U0600): The A5 series processing chip adopts dual-core ARM Cortex-A9 dual

The core architecture supports low-power DDR2 DRAM. The computing performance is 2 times higher than that of A4 processor.

Using dual-instruction decoding, multiple tasks can be executed in parallel, maximizing processor performance. exist

In terms of image processing, the chip integrates the Power VR SGX543MP2 graphics processing core.

The performance is 9 times that of A4. The main processing chip is mainly responsible for processing various data and signals in the system.

Calculate processing.

(3) Audio coding and decoding unit (U3600): Filters the audio data and signals in the system,

Quantization, encoding, decoding and other related processing. In the IPAD, the audio signal amplifier U3700 is also used

and U3710, used to amplify the audio signal to a certain extent and drive the speaker to vibrate and produce sound.

(4) NAND memory (U1400&U1410): NAND memory is equivalent to the hardware in a PC.

disk and write data in batches through mapping. NAND memory is slow to read and fast to write, and is usually used to store batches.

Quantitative data (such as information files, image data, video files, etc.).

(5) NOR memory: NOR memory has the ability to randomly access and write bytes.

Reading is fast and writing is slow. Usually used to store system software, application software and other data information.

(6) Double-rate asynchronous dynamic memory DDR (U1600/U1700): On the rising edge of the clock signal and

Data reading and writing operations are performed on the falling edge, which is fast and mainly used for fast data access.

(7) Touch screen data processing chip (U3100, U3101, U3003): used to store Grape firmware

information, control Grape input and output signals, and process Grape related data.

5. Sensor Flex

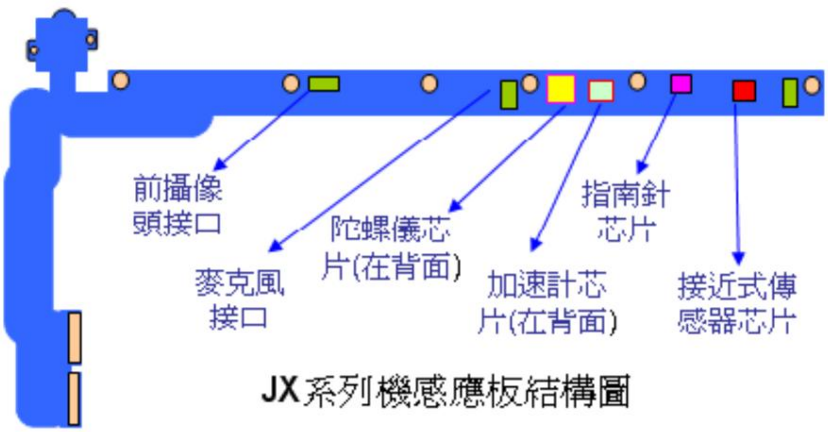
The reason why IPAD is popular all over the world is inseparable from the detection and processing of environmental information by various sensor chips.

reason. In IPAD2&3, the sensor board mainly integrates accelerometer, gyroscope, compass, and proximity sensor.

Four sensor chips are used to sense parameters related to the system and the environment. At the same time, induction

The board also serves as a signal channel for data transmission between the front and rear cameras, MIC, HP and buttons and the motherboard.

This enables timely and reliable data transmission between these modules and the motherboard.



JX系列機感應板結構圖

(1) Accelerometer: The acceleration sensor is used for basic posture recognition and environment perception.

This type of sensors began to explode in 2008, and now mobile phones are basically equipped with 3D sensors.

That is to say, it is used to measure the acceleration force on the three axes of x, y, and z. Acceleration force is when an object accelerates

The force acting on the object during the process is like the gravity of the earth, that is, gravity. Laptop hard drive protection function

What can be used is to dynamically monitor the vibration of the notebook through the acceleration sensor, and based on this vibration

Choose to shut down the hard drive or continue running. This can protect the hard drive to the greatest extent due to vibration

Damage, to protect the data inside to the greatest extent possible. In addition, in some high-end digital cameras and camcorders,

Use an acceleration sensor to detect hand vibrations when shooting, and automatically adjust the

The focus of the camera. Acceleration sensors are more useful in detecting real-time background environmental information of people. Compare

For example, by analyzing and processing the changing values of acceleration on three axes, the mobile phone can know where you are now.

Walking or biking or taking a car, going uphill or downhill, etc. In IPAD, through accelerometer

Sense the angle formed by the X, Y, Z axes or any two axes to calculate the IPAD tilt angle and gravity acceleration

degree value, thereby calculating the current acceleration and gravity of the IPAD, and combining it with the program to make the screen image

Changes as the machine status changes. In addition, the measured acceleration can also be combined with the GPS initial

Speed, calculates the current speed and distance traveled, plus the device turning information and slope measured by the gyroscope

Small and large, it can achieve full battery life in GPS blind spots.

(2) Gyroscope: The main function of the gyroscope is to assist the IPAD in GPS signal processing.

Number of blind spots to enable continued navigation. In addition, the three-axis gyroscope will be combined with the distance sensor, light sensor,

The combination of the orientation sensor brings the human-computer interaction function of IPAD to a new level. Gyro

It is based on the theory of conservation of angular momentum and measures the rotation rate along a specific coordinate axis. in use,

When the gyroscope's rotor rotates at high speed, it always points in a fixed direction. When the moving object moves

When the direction deviates from the predetermined direction, the gyroscope can feel it. In modern aviation equipment, pilots

When driving, more than ten gyroscopes are used to measure whether the body is rolling and how.

Tumbling. Microelectromechanical systems (MEMS) gyroscopes are used in IPADs.

MEMS (Micro Electro Mechanical Systems) Gyroscope

The instrument uses the Coriolis force (an object that moves in a straight line in a rotating system uses inertia to maintain its original motion.

State, due to the rotation of the system itself, the position of the particle in the system will change over a period of time. body of revolution

It is a perspective observation, and the direction of the original movement trend will be deflected to a certain extent). If the object is on the disk

Without radial motion, the Coriolis force would not occur. In the design of MEMS gyroscope, this object

The body is driven and constantly moves back and forth in radial motion or oscillates. The Coriolis force corresponding to this is not

The stop changes back and forth in the lateral direction, and may cause the object to oscillate slightly in the lateral direction, and the phase is exactly in line with the driving

The force difference is 90 degrees. MEMS gyroscopes typically have movable capacitive plates in two directions. Radial capacitor plate plus

The oscillating voltage forces the object to move radially (somewhat like the self-test mode in an accelerometer), and the transverse voltage

The capacitance plate measures the change in capacitance due to transverse Coriolis motion (just like an accelerometer measures acceleration

Spend). Because the Coriolis force is proportional to the angular velocity, the angular velocity can be calculated from the change in capacitance.

(3) Compass: Also known as electronic compass, when current passes through a conductor located in a magnetic field

When the conductor is a conductor, the magnetic field will produce a transverse Lorentz force on the electrons in the conductor, thus generating charges.

Deflection, the direction of deflection is perpendicular to the direction of the current and the direction of the magnetic field, and the positive and negative charges are deflected

The directions are opposite, creating a voltage difference across the conductor. This voltage difference is also called the Hall voltage, and the two

Proportional to two factors: current size and magnetic field strength. If the direction of the magnetic field is non-perpendicular to the conductor,

The actual magnetic field acting is actually a vector component of the original magnetic field. through two or more mutual

Vertical Hall sensors can use linear algebra operations to process the sensed data accordingly.

Calculate the parameters related to the equipment's relative geomagnetic field. When the GPS signal encounters terrain or obstacles, the accuracy will decrease.

reduce. In areas with many high-rise buildings, the signal effectiveness is about 60%, and the terminal cannot obtain heading information when it is stationary.

News, in IPAD, COMPASS integrated navigation and orientation is used to effectively compensate for GPS signals.

Ensure that the signal efficiency reaches 100%, that is, "lost stars but not lost direction".

(4) Proximity sensor: used to detect close target objects. This type of sensor

Changes in electromagnetic fields or electrostatic fields are often used, or changes in reflected waves of emitted electromagnetic waves are measured.

situation to make judgments. Because the methods are different, the types of target objects for proximity sensors are also different.

Likewise, some are for metal objects, and some are for plastic objects. Specific to mobile phones, the current

Mobile phones use a new generation of reflective optical proximity sensors, which can detect a variety of surface types.

detection. The process is simple, they emit infrared light that is invisible to the human eye. Once a call comes in, the phone

You will definitely answer the call. When you answer the call, your facial skin will be very close to the sensor, so you only need to use light

The chemical detector detects changes in the total amount of light reflected from the skin, thereby improving the power saving function of the mobile phone.

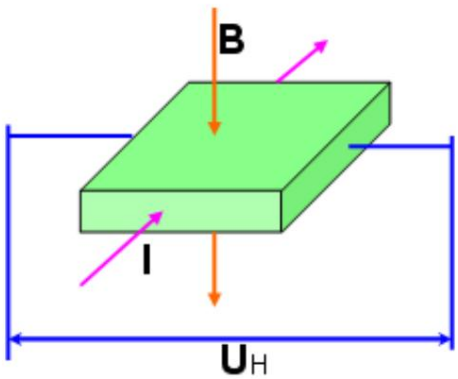
For example, determining when to automatically turn on or off the display, keyboard backlight or touch function, or even

As for when to automatically shut down/standby.

Proximity sensors are also used to sense people

The distance between the machine and the machine, combined with the software, makes the machine audio communication

Reduce radiation power to prevent harm to the human body.



霍爾效應

(5), Hall chip (HALL): in semiconductor

A controlled current I is passed through both ends of the sheet, and a uniform magnetic field with a magnetic induction intensity B is applied in the vertical direction of the sheet.

field, according to the formula UH=KIB/d (where d is the thickness of the sheet), then between the vertical current and magnetic field

direction, a Hall voltage of magnitude UH will be generated . In the IPAD, the Hall chip combines magnets and protection

Set (B81 fixture) is used. When the B81 fixture is close to or away from the magnet, the changing magnetic field acts on the Hall

Hall chip, the corresponding level signal will be generated on the Hall chip, and the processor receives this level signal,

The machine will be in power saving mode through program control.

(6) Light sensor (ALS): The photosensitive chip passes the light intensity of the environment where the receiver is located, combined with the software

body, control and adjust the luminous intensity of the LCD backlight module, thereby improving the brightness, chroma, and contrast of the LCD.

Adjust to the best condition in your environment. The output data provided by the light sensor is based on a combination of two

derived from sensor readings, one of which detects visible and infrared light, and the other

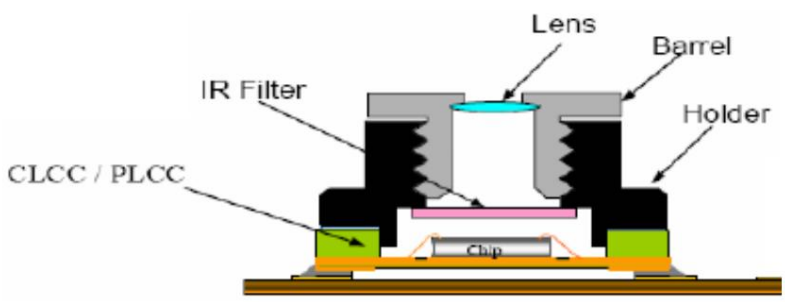
Only detect infrared light, subtract the two readings, and digitize the result to get a response similar to that of the human eye.

And evaluate the impact of visible light intensity and infrared rays, and then adjust the LCD backlight

Module lighting status.

JX后攝像頭

6. Front & **Back Camera**



Cameras currently used on handheld terminals

The heads are all CCD (Charge Coupled Device)

or CMOS (complementary metal oxide

semiconductor) as a photosensitive device. exist

When working, the external light is gathered onto the CCD or COMS photosensitive chip through the optical lens group, and the sensor

The three photosensitive units of each pixel on the optical chip sense the three colors of R/G/B respectively, and

which is converted into electrical signals. After digital signal processing by a microprocessor chip, it can be converted into digital

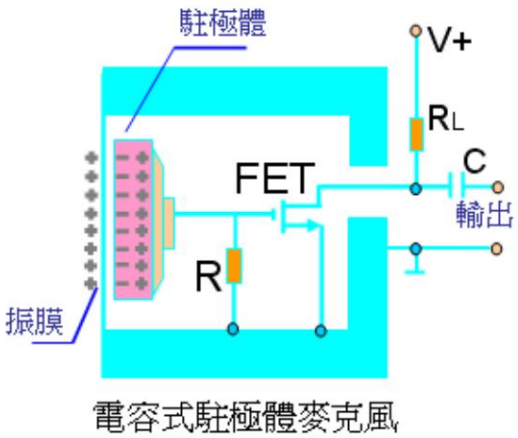
pixel value. In this way, the camera can store external image information in the memory or

displayed on the LCD screen. At present, many cameras use automatic cameras to capture scenes at different distances.

The dynamic focus function automatically adjusts the distance between the lens and the photosensitive chip by detecting the distance of the scene being photographed.

Make the object distance, phase distance and focal length satisfy the imaging formula when shooting.

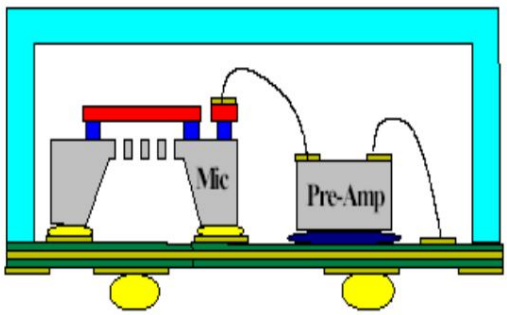
7. Microphone & Speaker



In IPAD2&3, in order to save space, improve performance, using a MEMS condenser microphone. On the phone In a capacitive electret microphone (also called a microphone), the vibration The membrane (nickel-plated surface), gasket and plate form a parallel plate capacitor. The surface of the back plate diaphragm is charged with a fixed

The electrostatic charge and the vibration of the external sound signal cause the diaphragm to vibrate, thus changing the relationship between the diaphragm and the back electrode.

The distance between the plates produces a change of ÿL. According to the formula C=ÿ·S/L (C: the capacity of the capacitor, ÿ: dielectric constant of the medium, S: area of parallel plates, L: distance between parallel plates) it can be seen that it is necessary To produce a change in ÿC, it is also known from the formula C=Q/V that due to the change in ÿC, the charging charge is fixed, so a change in ÿV is bound to occur. In this way, a preliminarily completed work by Shengxin signal to electrical signal conversion. Because this signal is very Weak, the internal resistance is very high and cannot be used directly because This also requires impedance transformation and amplification. FET field effect Should the tube be a voltage controlled component, the output of the drain



Current is controlled by source and gate voltages. Since the two poles of the capacitor are connected to the S pole and G pole of the FET pole, so it is equivalent to adding a ÿv change between the S pole and G pole of the FET, and the drain of the FET The pole current I produces a change of ÿID, so the change of this current is on the resistor RL. A change in ÿVD is generated, and this change in voltage can be output through the capacitor C0. This The change in voltage is caused by the sound pressure, so the entire microphone completes an acoustic-to-electrical conversion process.

About.

MEMS MIC contains two chips, MEMS and ASIC (see the picture on the previous page). These two chips

are packaged together in a surface mount component, using COB (Chip On Board) technology to

connect. The MEMS chip consists of a rigid perforated back electrode and an elastic membrane that acts as a capacitor and

Convert sound pressure into changes in capacitance. ASIC chips use

It is used to detect changes in MEMS capacitance and block its signal.

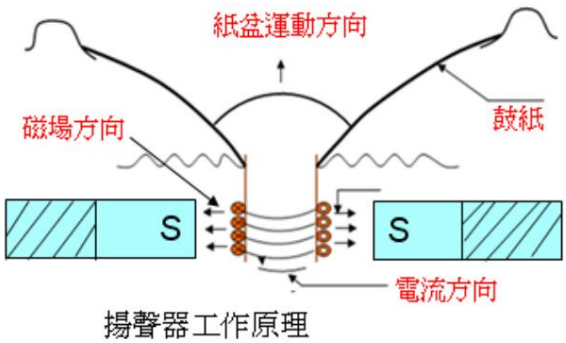
Anti-conversion and amplification, while adjusting the frequency response for later use

Continuation circuit for processing

佛萊明左手定則

Working principle of electric speakers: When a current flows through a conductor perpendicular to the magnetic field, the conductor

will be affected in the direction perpendicular to the magnetic field and current



揚聲器工作原理

Force acts. The direction of this force can be clarified by using Buddha.

Hand rule judgment (as shown on the left: where I is the current square

direction, B is the magnetic field direction, F is the force direction).

With this knowledge, working on electrodynamic speakers

The principle can be easily understood. In an electric speaker, the magnetic circuit gap of the speaker has a

There is a homogeneous annular magnetic field everywhere, and the coil roll is located in this gap. When the external signal current is generated,

When changes occur, according to Buddha's left-hand rule, the coil will be stressed, and the magnitude and direction of the current will change.

The force is different, which in turn drives the coil to move, causing the drum paper connected with the voice coil to vibrate up and down.

Radiates sound outward.

8. I2C bus (Inter-Integrated Circuit): I2C bus is a kind of circuit developed by PHILIPS company

A two-wire serial bus developed to connect microcontrollers and their peripherals. The I2C bus originated from

Originally developed for audio and video equipment in the 1980s. The I2C bus is composed of data line SDA and

The serial bus composed of clock SCL can send and receive data. Between the CPU and the controlled IC, the IC

Bidirectional transmission with IC, the maximum transmission rate is 100kbps. Various controlled circuits are connected in parallel

on this bus, but just like a telephone, it can only work if its own number is dialed, so each phone

Each channel and module has a unique address. During the information transmission process, each module connected in parallel on the I2C bus

The circuit is both a master controller (or controlled device) and a transmitter (or receiver), depending on what it wants to accomplish.

function. The control signal sent by the CPU is divided into two parts: address encoding and control quantity. The address encoding is used

To select the location, that is, connect the circuit that needs to be controlled and determine the type of control; the control amount determines the type of adjustment.

(such as contrast, brightness, etc.) and the amount that needs to be adjusted. In this way, although each control circuit is hung on the same

On the bus, they are independent of each other and unrelated to each other.

9. I2S bus (Inter-IC Sound)

The I2S bus was developed by Philips for the transmission of audio data between digital audio devices.

A bus standard that is specifically used for data transmission between audio devices and is widely used in various

Multimedia system. It uses a design that transmits clock and data signals along independent wires.

The material and clock signal are separated to avoid distortion caused by time difference, saving users money on purchasing resistant audio

The cost of dithering professional equipment. The I2S standard stipulates both hardware interface specifications and digital

The format of audio data. I2S has 3 main signals: 1. Serial clock SCLK, also called bit clock

(BCLK), that is, corresponding to each bit of digital audio data, SCLK has 1 pulse. SCLK

Frequency = 2 × sampling frequency × number of sampling bits 2. Frame clock LRCK, (also called WS), used for switching

Data for left and right channels. LRCK is "1", indicating that the data of the left channel is being transmitted, and "0"

It means that the data of the right channel is being transmitted. The frequency of LRCK is equal to the sampling frequency. 3. Serial data

SDATA is audio data represented by two's complement code.

10. PCI bus (Peripheral Component Interconnect)

The PCI bus is a region-defining bus introduced by Intel in 1991.

bus standard. This standard allows up to 10 PCI-compliant expansion cards to be installed in the computer. Head

Currently, the 32-bit, 33MHz or 32-bit, 66MHz PCI bus is widely used. The 64bit

PCI-X slots are more commonly used in server products. Structurally, PCI is between the CPU and the original

The first-level bus inserted between the system buses is specifically managed by a bridge circuit.

And realize the interface between the upper and lower to coordinate the transmission of data. The manager provides signal buffering, which can

Maintain high performance at clock frequency, suitable for providing connections for graphics cards, sound effects cards, network cards, MODEM and other equipment

interface, operating frequency is 33MHz/66MHz.

11. SPI Serial Peripheral Interface

SPI is a synchronous serial communication method introduced by Motorola. It is a four-wire synchronous

Bus, because of its strong hardware functions, the software related to SPI is quite simple, allowing the CPU to have more

Time to deal with other matters. The SPI bus system is a synchronous serial peripheral interface that enables MCU

Communicates serially with various peripheral devices to exchange data. Peripheral settings FLASH RAM,

Network controller, LCD display driver, A/D converter and MCU, etc. The SPI bus system can directly

Directly connected to a variety of standard peripheral devices produced by various manufacturers. This interface generally uses 4 lines: serial

Column clock line (SCK), host input/slave output data line MISO, host output/slave input data

Material line MOSI and low-level active slave select line SS (some SPI interface chips have interrupt signals

Line INT or INT, some SPI interface chips do not have the host output/slave input data line MOSI). SPI

The communication principle is very simple. It works in a master-slave mode. This mode usually has a master device and a

or multiple slave devices, at least 4 wires are required. In fact, 3 wires are also acceptable (when used for one-way transmission, also

That's half-duplex mode). Also common to all SPI-based devices, they are SDI (data login),

SDO (data output), SCK (clock), CS (chip select). (1) SDO – main device data output,

Slave device data login; (2) SDI – master device data login, slave device data output; (3) SCLK –

Clock signal, generated by the master device; (4) CS – slave device enable signal, controlled by the master device.

12. UART universal asynchronous receiving/transmitting device

UART (Universal Asynchronous Receiver & Transmitter): is a parallel

The chip that converts input into serial output is usually integrated on the motherboard because computers use parallel

Data cannot be sent directly to the Modem. It must be sorted by UART for asynchronous transmission.

lose. The process is: the CPU first puts the data to be written into the serial device into the UART register (temporary

time memory block), and then transferred to the

For serial devices, if there is no FIFO, the information will become messy and impossible to transmit to the Modem.

2.4. Introduction to IPAD wireless communication technology

In the IPAD3 series J2&J2A, a WiFi module for networking has been integrated for short-term use.

Bluetooth module for distance transmission information, GPS module for positioning and navigation, and wireless communication

Xin's 3G module. The following will give a brief introduction to the basic knowledge of wireless communication.

1. **Wireless Fidelity**

Also called WLAN (wireless local area network). Replace cables in Ethernet with radio for signaling

transmission and broadband access. WiFi uses 2.4GHZ (2400~2483.5MHZ, divided into 13 channels, each

channels occupy 22MHZ bandwidth), 5.8GHZ (5725~5850MHZ, divided into 5 channels, each channel

The ISM (industrial, scientific, medical, etc.) wireless communication free frequency band with a channel bandwidth of 20MHZ is used

Direct sequence spread spectrum scheme (DSSS: Direct Sequence Spread Spectrum), FM spread spectrum

(FHSS) and orthogonal frequency division multiplexing (OFDM: Orthogonal Frequency Divided Modulation

Utilizes multiple subcarriers to transmit simultaneously to increase the data transmission rate) technology for data transmission. maximum

The transmission rate reaches 54Mbps. The 802.11 standard (an open compliant standard) defines the physical layer and media access

Media Access Control protocol specification. Allow wireless LAN and wireless protocol providers

Establish interoperability within a certain scope. The following is a brief introduction to the 802.11 standard.

802.11: Original standard in 1997 (2Mpbs, 2.4GHZ) 802.11a: Physical layer supplement in 1999 (54M, 5GHZ)

802.11b: Physical layer supplement in 1999 (11M, 2.4GHZ) 802.11c: Add 802.11d medium access layer bridging

802.11d: Adjustments made according to the radio regulations of various countries 802.11e: Support for service levels

802.11f: Interconnection of base stations

802.11g: Physical layer supplement (54Mbps, 2.4GHZ)

802.11h: Wireless coverage radius adjustment

802.11i: Installation and Authentication Supplement

802.11n: Introducing multiple input and output and 40Mbit channel width technology, an extension of 802.11a&g.

HSDPAÿHigh Speed Down Link Packet Access

2. Bluetooth

Bluetooth: Short-range radio frequency link, using 2.4GHZ, ISM (Industrial, Scientific,

Medicine) Global free frequency band. Time division duplex transmission, the rate is 1Mb/s, the transmission distance is usually

10cm~10m, can be extended to 100m by increasing the power, using fast confirmation and frequency hopping scheme to ensure link stability

Certainly. Divide the frequency band into several frequency hopping channels. In a connection, the radio transceiver changes according to the pseudo-random code.

The interrupt jumps from one channel to another, and only the sending and receiving parties communicate according to this rule. through spread spectrum technology

It can widen the narrow band hundreds of times. The BT protocol is a combination of circuit switching and packet switching.

Synchronization packets can be transmitted in the slot, each sent at a different frequency. One information package nominally occupies one

channels, but can actually be expanded to five channels. Support non-different

step data transfer.

3. Global Positioning System (GPS)

GPS, also known as satellite navigation and ranging, is based on satellites

based radio navigation and positioning system. Versatility, globality, all-weather, continuity, and immediacy

Navigation positioning timing can provide users with precise three-dimensional coordinates and speed. Its spatial part is determined by distance

The spherical surface is 20200km and consists of 24 synchronous satellites in 6 orbits. At an angle of 60 degrees to each other, the satellite atoms

The reference frequency generated by the clock is f0=10.23MHZ, and the reference frequency signal is transmitted after being multiplied. Frequency multiplier

(f1=154*f0=1575.42MHZ, F2=120*f0=1227.60MHZ). Eliminate ionospheric delay transmission

To determine the impact of transmission on the measurement signal, the relevant parameters can be calculated by establishing a system of linear equations.

$$(X_n-X)^2 + (Y_n-Y)^2 + (Z_n-Z)^2 + C^2 * (t-t0_n) = d_n^2$$

Among them, (X, Y, Z) are the receiver coordinates, (Xn, Yn, Zn) are the satellite coordinates, t

is the receiver time, t0n is the time of each satellite, establish a system of equations through four satellites and perform mathematical operations

You can determine the location of the receiver.

The GPS ground control part consists of a master control station (Colorado spring: comprehensive detection and control satellite

According to the GPS related data obtained from the monitoring station test, the satellite ephemeris and satellite time are calculated.

The clock correction parameters are then injected into the satellite. When an abnormality occurs on a satellite, start the

working with backup satellites), three injection stations (Ascencion, Diego Garcia, Kwajalein:

Inject satellite ephemeris and satellite clock correction parameters into the satellite, calibrate the operation data, and ensure the normal operation of the satellite.

transfer), five monitoring stations (main control station + injection station + Hawaii: detect satellite operation status, obtain satellite satellite

Calendar and satellite clock correction parameters and other data).

Since Marconi first used radio to transmit telegraph messages, radio communication technology has developed as follows

In full swing, there is a gradual transition from traditional analog communication to data communication and broadband communication. By using various

Technical means continue to expand channel transmission capacity and increase data transmission rates. The following will be combined with Apple IPAD3

Provide a brief introduction to wireless communication technology. The picture above shows the development process of wireless communication technology, divided from top to bottom.

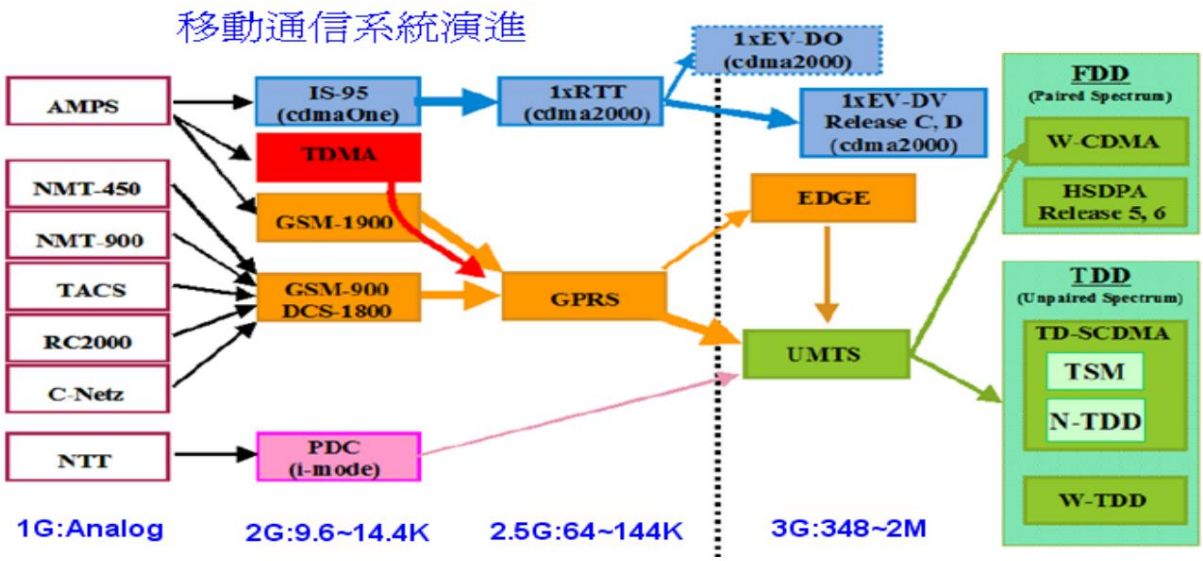
The development process of mobile communication technology is adopted in North America, Europe and Japan respectively.

4. Global System of Mobile **Communication**

The GSM system is a digital cellular mobile communications system. Its multiple access method uses frequency division multiplexing and

Time division multiplexing (FDMA-TDMA) hybrid technology. Uplink frequency 890~915MHZ, downlink frequency

935~960MHZ. GSM has allocated 125 carrier frequencies in the 25MHZ frequency band (actually 124 are used



, the last band is unused). The carrier frequency interval is 200KHZ, and each carrier frequency is time-division multiplexed by 8 channels.

use. Therefore, the actual maximum number of channels available in the GSM system is 8*125=1000 (actually 992,

The last channel is unused).

The GSM network structure is relatively flexible, consisting of network subsystem (NSS), base station subsystem (BSS),

It consists of the Operations and Operations Support Subsystem (OSS). Network subsystem (NNS) main functional unit package

Including Mobility Center (MSC), Home Location Register (HLR), Visitor Location Register (HLR), Identification

Authorization (Authentication) Center (AUC), Visitor Location Register (VLR) and Device Identifier. Base station subsystem

System (BBS) includes base station controller (BSC), base transceiver station (BTS) and local control terminal.

The operation and management system (OSS) includes the network management center (NMC), data post-processing system (DPPS),

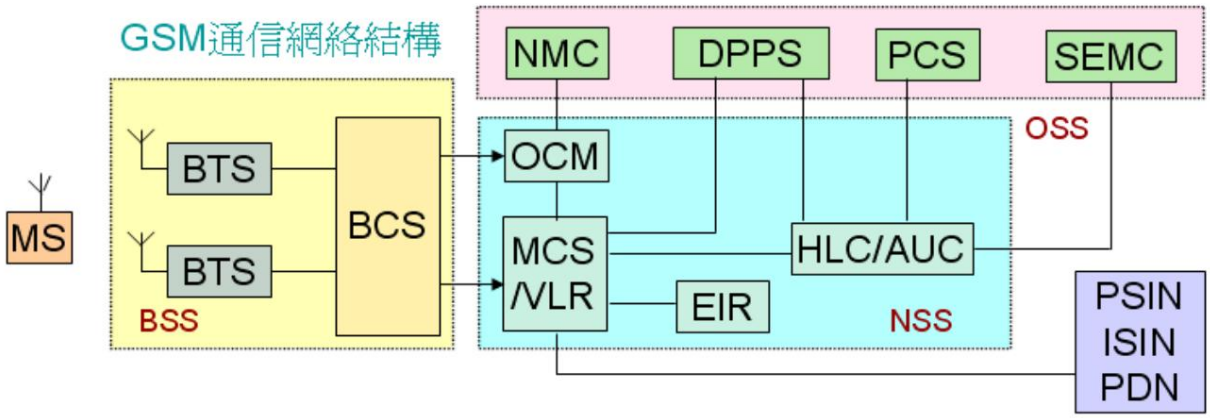
Subscriber ID Personalization Center (PCS) and Security Management Center (SEMC); the network subsystem can

To connect the Integrated Services Digital Network (ISDN), the Public Telephone Network (PSIN) and the Public Data Network (PDN).

GSM uses Gaussian minimum shift keying (GSMK), and the normalized bandwidth is BT=0.3. The measurement result is

The frequency and phase error of the radio signal are the main methods to test the quality of the modulated signal of the transmitter. frequency error

It means that after taking into account the modulation and phase errors, the frequency of the transmitted signal is the same as the absolute radio frequency channel



The difference between the corresponding nominal frequencies. Calculating the slope of this regression line gives you the frequency error.

The Global Mobile Communications System is divided into GSM850, EGSM900, and DCS according to different frequency bands used.

1800,PCS1900. Our country was the first to use GSM900. With the scale of communication network and the number of users,

With the rapid development of China, the original GSM900 network frequency has become increasingly tight. In order to better meet the increasing needs of users,

In order to meet the long-term demand, our country has introduced DCS1800 and adopted GSM900 network as the basis. DCS1800

The network is a supplementary networking method, forming a GSM900/DCS1800 dual-band network to alleviate high traffic density.

The situation of wireless channels in concentrated areas is becoming increasingly tense. As long as the user is using a dual-band mobile phone, he can

ÿDCS1800 Freely switch between the two and automatically select the best channel for calls, even during a call

The phone can also automatically switch between the two networks without the user noticing, and the phone selects the best one.

The connection rate has been improved.

GSM900 main frequency band (P-GSM) Uplink: 890MHz-915MHz Downlink: 935MHz-960MHz

GSM extended frequency band (E-GSM) Uplink: 880MHz-890MHz Downlink: 925MHz-935MHz

DCS1800 frequency band uplink: 1710MHz-1785MHz Downlink: 1805MHz-1880MHz

GSM900 main frequency band (P-GSM) uplink: Fl=890 + 0.2 N (1N 12) downlink: Fu=Fl + 45

GSM extended (E-GSM) uplink: Fl=890 + 0.2 (N-1024) downlink: Fu=Fl + 45 (975N 1023)

DCS1800 frequency band uplink: Fl=1710.2 + 0.2 (N-512) Downlink: Fu=Fl + 95(512N 885)

5. Universal Mobile Telecommunications System (UMTS)

UMTS (Universal Mobile Telecommunications System), meaning universal mobile

Communication Systems. UMTS is one of the global 3G standards developed by the International Organization for Standardization 3GPP. its lord

It includes a series of technical specifications and interface protocols such as CDMA access network and packetized core network.

Certainly. As a complete 3G mobile communication technology standard, UMTS is not limited to defining air media

noodle. In addition to the continuous improvement of WCDMA as the preferred air interface technology, UMTS has also introduced

TD-SCDMA and HSDPA technology, a third-generation (3G) mobile phone technology. It uses

WCDMA, as the underlying standard, is finalized by 3GPP and represents Europe's support for ITU IMT-2000. About 3G

response to cellular wireless system requirements). UMTS is sometimes called 3GSM, emphasizing the combination of 3G technology and

And it is the follow-up standard of the GSM standard. UMTS packet switching system evolved from GPRS system

Come, the architecture of the system is quite similar.

UMTS supports a transmission rate of 1920kbps (not the commonly seen 2Mbps), but in

The typical maximum rate in a realistic high-load system is only about 384Kbps. Even so, the data speed has

It is higher than the GSM error correction data channel 14.4kbps or multiple HSCSD channels composed of 14.4 kbps,

Truly affordable mobile WWW access and MMS. UMTS combines

The air interface of W-CDMA (the air communication protocol for mobile phones and base stations), the mobile

The core part of the application (this protocol provides call routing functions from or to users), and GSM

Speech coding algorithms such as Adaptive Multi-Rate (AMR) and Enhanced Full Rate (EFR) (which define

methods of digitizing, compressing, and encoding speech). In other words, W-CDMA (according to IMT-2000

(definition) is just an air interface, while UMTS is a complete system for 3G global mobile communications.

The integrated protocol stack can be used to replace GSM. However, in practice W-CDMA is often used as the

The general name of the 3G standard family using this air interface, including UMTS, FOMA and J-Phone.

At the air interface, UMTS is compatible with GSM. Although all UMTS mobile phones currently on the market are

UMTS/GSM dual-mode mobile phones, but they can all work well in pure GSM networks. if

When a UMTS user roams to a place without UMTS coverage, his phone will automatically switch to GSM

mode (roaming charges apply). If the user roams outside the UMTS coverage area during a call, then

The phone will be switched to an area with GSM coverage. Ordinary GSM mobile phones cannot operate on UMTS networks

use.

6ÿ3GÿThe **Third Generation Communicationÿ**

The third generation mobile communication system combines wireless communications with multimedia communications such as the Internet

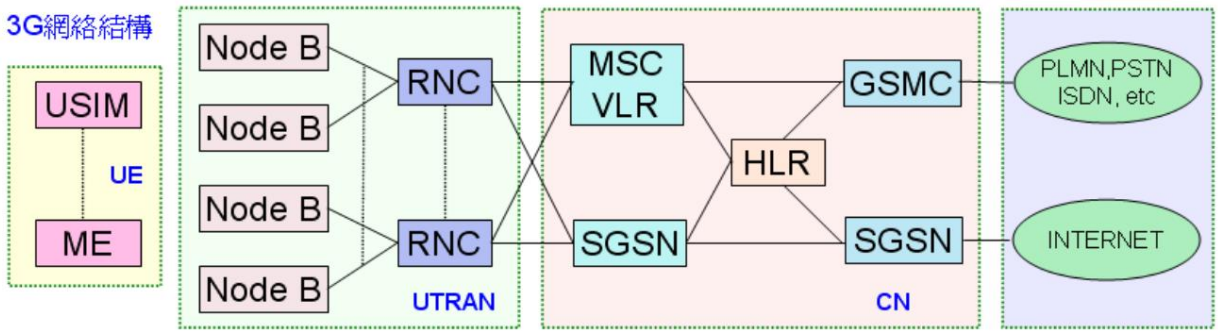
a new generation of mobile communication systems. Able to process images, music, videos and other forms, provide web browsing,

Teleconferencing, e-commerce and other information services. Wireless networks must support different transmission rates, indoors,

Outdoor and driving environments require transmission rates of at least 2Mbps, 384kbps and 144kbps. Globally

WCDMA (Nordic/China Unicom), CDMA2000 (North America/China Telecom), TD-SCDMA (China

China Mobile). Three standards. The following is a 3G network diagram.



UE: User Equipment ME: Mobile Equipment mobile equipment

USIN: UMTS Subscriber Identity Module CN: Core Network core network

UARTANÿUMTS Terrestrial Radio Access Network

MSC/VLC: Mainly responsible for calling, mobility management, authentication and encryption.

GMSC: routing analysis, inter-network connection, inter-network settlement.

SGSN: routing forwarding, mobility management, authentication, encryption.

HLR: Provides user subscription information storage, new business support, and enhanced authentication.

(1), WCDMA (Wideband Code Division Multiple Access)

Wideband Code Division Multiple Access, WCDMA system

It consists of three parts: CN (core network), UTRAN (UMTS terrestrial access network), UE (user equipment

prepared). The CN handles the exchange and selection of call and data links to and from external networks, UTRAN

Handling all wireless access related functions, the UE is the interface with the user. WCDMA is a

Direct sequence code division multiple access technology (DS-CDMA), the information is expanded into a bandwidth of 3.84MHZ, and then

Propagating within a bandwidth of 5MHZ, WCDMA allows each 5MHZ carrier to handle from 8Kbps

Mixed services to 2Mbps. In addition, circuit switching services and grouping can be performed on the same channel.

switching services, utilizing multiple circuit and packet-switched connections on a single terminal to achieve true

multimedia services. Can support businesses with different quality requirements.

(2), TD-SCDMA (time division duplex synchronous code division multiple access)

Time Division Duplex Synchronous Code Division Multiple Access (Time Division Duplex Synchronous Code Division

Access), this technology is a mobile communication standard proposed by Datang Telecom in 1999 and is China's international

A mobile communication system with independent intellectual property rights proposed for the first time. The system bandwidth is 1.6MHZ, code

The chip rate is 1.28Mbps. TD-SCDMA was accepted by 3GPP as the UARA TDD standard in 1999

First, TD-SCDMA is one of the most important features of the 3GPP R4 standard. It uses time division multiplexing

(TDD) method (the other two adopt FDD method).

(3), CDMA2000 (Code Division Multiple Access 2000)

Code Division Multiple Access 2000: 2.5 generation mobile communication technology

technology, which is a broadband CDMA technology developed from narrowband CDMA (CDMA IS-95) technology.

Mainly promoted by the United States, this standard proposes from CDMA IS-95~CDMA 2000 1X~CDMA 2000 3X

(3G) evolution strategy, CDMA 2000 3X applies multi-carrier technology, by using three carriers

Increase bandwidth. CDMA2000 technology uses orthogonal spreading codes to enable different users to

to transmit data on the same frequency band. CDMA technology increases system performance by sacrificing error rates and reducing sound quality.

The capacity of the cell can be increased by reducing the capacity of the surrounding cells.

Space diversity, time diversity, polarization diversity and other technologies can be used to reduce multipath fading. Data interleaving can be used to reduce

Low bit error rate. Currently, the United States, Japan, and South Korea mainly use this technology, which has clear voice and no

It is easy to drop the line, has low transmission power, and has strong confidentiality. Its power is only 1/60 of GSM.

CDMA technology makes video in mobile communications possible.

7. 4G (fourth generation mobile communication system)

4G is a high-speed mobile phone network that combines 3G and WLAN.

The bandwidth of ADSL can generally reach 100Mb/s or more, and the application of wireless network technology allows users to integrate

and can utilize WIFI, UMTS or other systems that will be introduced in the future.

technology, and can achieve higher frequency utilization.

8. LTE (Long Term Evolution of Universal Mobile Communications System)

Universal Mobile Telecommunications System Long Term Evolution (UMTS Long Term Evolution), also known as LTE

The main objectives of EUTRA (Evolved UMTS Terrestrial Radio Access) are: (1) Peak rate

Reach 100 Mbps (downlink) and 50 Mbps (uplink). (2) Reduce transmission delay. (3) Take into account

(4) Able to operate in TDD and FDD modes. (5) Variable bandwidth, up to

20MHZ. (6) Carrier aggregation and coordinated multi-point relay transmission technology.

Chapter 3, IPAD product testing knowledge

From IPAD1 to IPAD3, Apple has continuously innovated product design concepts and optimized product structure.

layout, integrate functional test modules, streamline the production test process, and make product assembly and testing more user-friendly

Personalization, to a large extent, avoids hidden process risks in the production and maintenance process, and improves product production efficiency.

Rate. However, changes remain unchanged, and the testing of various functional modules still follows the corresponding scientific theories and

Technical specifications, this chapter is based on the IPAD3 series product production and testing process, combined with relevant specific tests

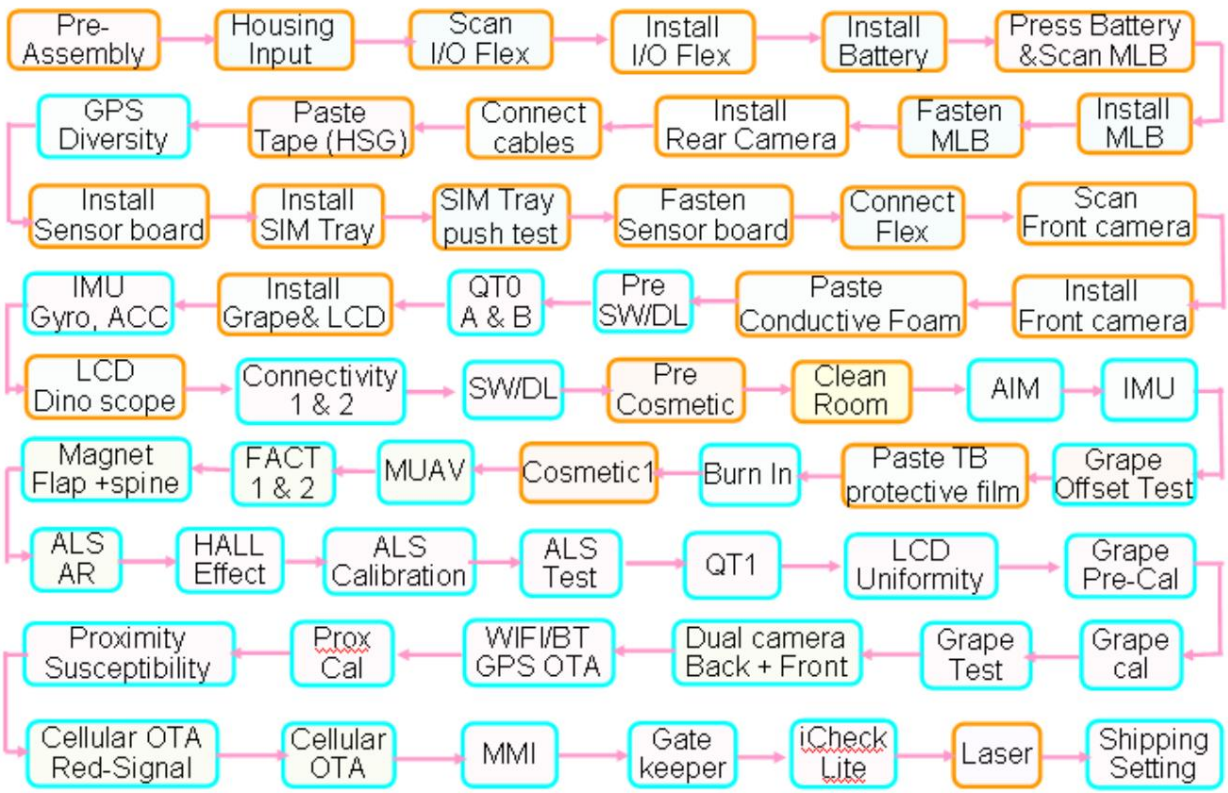
Workstation, refer to the corresponding electronic product testing specifications, and make a corresponding summary of the IPAD series product testing knowledge.

Narration and summary.

3.1. IPAD3 production line test process

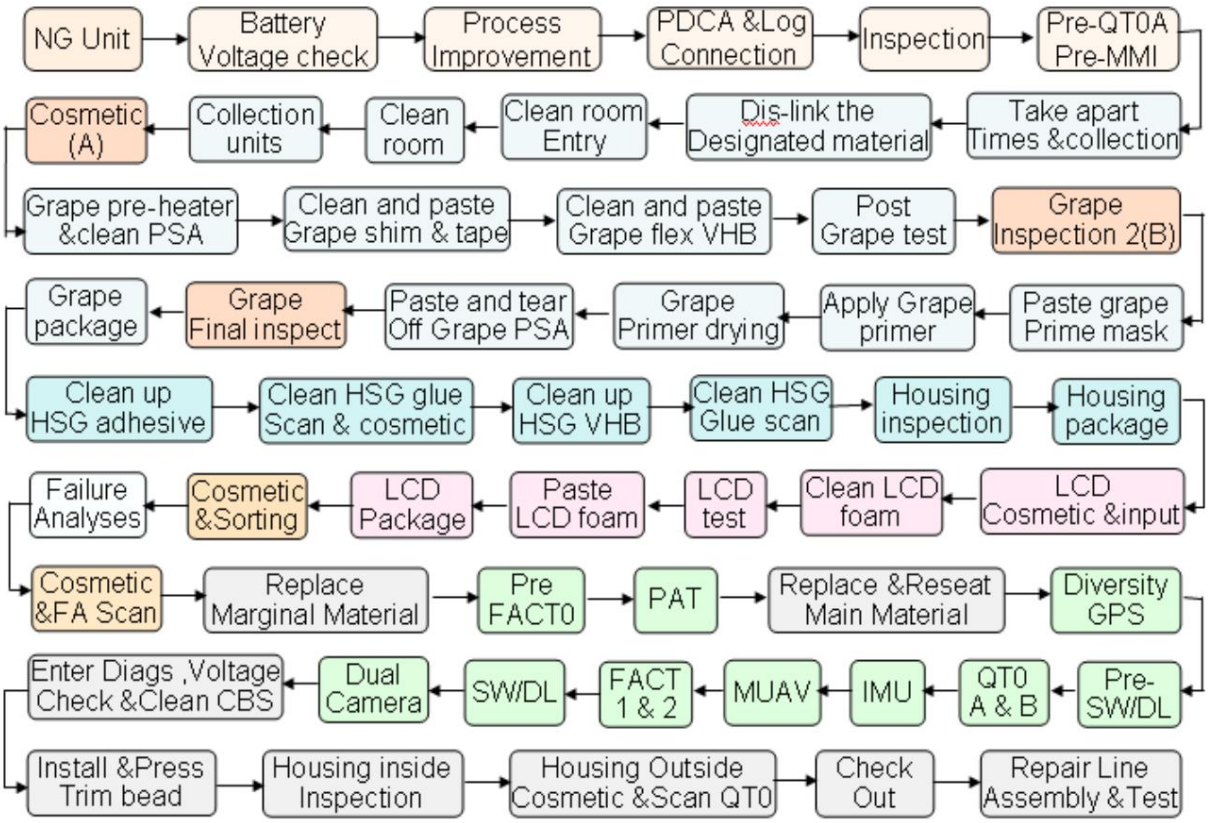
The following is the assembly and testing process of the IPAD3 machine in the FATP section of the production line (orange is assembly, blue is testing

Test), in which the single performance testing and assembly of WF, MIC, SPK and Button are all completed in advance.



When the UUT fails at a certain test station, the machine must enter the maintenance area for analysis and replacement.

Parts, the following will briefly summarize the maintenance process during the mass production stage.



The light green box is the Cell Line related test station. Maintenance area upper module, analysis area,

The lower module consists of three parts. The upper module is mainly used for disassembly and external inspection of LCD, Grape and HSG respectively.

Testing, processing. The analysis area (FA) mainly analyzes defective items detected on the production line. in analysis

After that, the machine flows into the lower module for reassembly and reassembly. After the parts are replaced and tested, the machine is checked out (out for maintenance).

The machine officially flows into the maintenance line, and the LCD and Grape are assembled and pressed in the normal way, and the normal production flow is followed.

process for test packaging. The following is a brief introduction to the testing principle based on IPAD3 related workstations.

3.2. IPAD3 electronic circuit test

Electronic circuit testing is what RE-FA calls the POWER module. The testing process must first

Download the test software. There are three IPAD system test software modes, iboot mode, Diags mode and OS

model. iboot mode is solidified in the memory and is the boot loader on iOS. When in recovery mode

When performing a restore or upgrade, Iboot detects the upgraded firmware version to ensure it is the latest version. otherwise,

Iboot will disable firmware recovery. Diags mode [Diagnose] is a simple diagnostic mode.

In Diags mode, you can command the mainboard to send or receive corresponding signals by inputting test instructions to detect

The chip is interrupted, whether the electronic circuit is smooth, and whether the relevant functional modules can produce specific excitation signals.

produces the expected response. OS mode is the operating system [Operation System], which is used for human-machine interface testing.

A simple operating system program developed for trial use. After downloading, the machine can operate through buttons like a PC.

Turn the phone on and off, take pictures by touching the corresponding icon, play video information in the memory, etc. also,

When the machine is shipped, the client operating system iOS must be downloaded. The three modes can be switched through commands

Change. OS mode is divided into several test modes (such as Burn In, Grape Cal, MMI, WiPAS

etc.), used to test different work stations. Switching between these modes can be achieved through the jump station command (as shown on the right

picture). After downloading the software, the machine can enter the corresponding test mode and send data to the UUT through the test equipment.

Send commands or drive signals to detect the electrical connectivity of the system and the basic performance of each functional module.

In addition, in order to ensure the quality of the machine and verify the stability and reliability of the system, aging tests must also be performed.

(Burnin), that is, allowing the machine to cycle on and off in Diags and OS modes, run continuously, and test the power

Check whether there is any abnormality in the battery, DDR, motherboard and other functional modules during the cycle and burn-in process.

1. Pre-SW/DLÿPre-Software Downloadÿ

Download the latest version of Diags schema from the server. With the bootloader booting, change Diags

Code is stored in NAND memory for quick testing of components (QT0A&B) individual modules and

Software support is provided for electrical connectivity of upper and lower components. Downloading software must meet the following conditions: (1), machine

The machine is in iboot mode or turned off (when the machine is turned off, plugging in the USB cable will cause the

Enter iboot mode). (2) The machine voltage is above 3.75V. (3) The machine can be started normally.

2. QT0A&BÿQuick **Test 0 A&Bÿ**

The quick test is designed to test

Electrical connectivity of the test bench.

When testing, first read the machine

Configuration information of each component of the platform and

Burn it into the motherboard with

Production Control System (SFC)

Verify the scanned information.

(read, write and verify

The information mainly includes: machine,

MLBÿSensor Flexÿ

Battery, NAND sequence

Apple出貨國別代碼							
簡稱	國別	Region		簡稱	國別	Region	
BZ	巴西	美洲	AMR	NF	法國	歐洲	EMEA
LL	美國			FD	德國		
E	墨西哥				瑞士		
C	加拿大			TY	意大利		
CI	智利				西班牙		
LE	阿根廷			RS	俄羅斯		
ZQ	牙買加			SO	南非		
KH	韓國	亞太	AP	KS	瑞典		
ID	印尼				芬蘭		
TH	泰國			KN	挪威		
TA	台灣				丹麥		
PP	菲律賓			GP	葡萄牙		
CH	中國				希臘		
J	日本			HC	捷克		
X	澳大利亞			HB	以色列		
ZP	新加坡			TU	土耳其		
	香港			PL	波瀾		
	馬來西亞			HN	印度		
	越南			GB	保加利亞		
B	英國	歐洲	EMEA	AE	阿聯酋		

No., machine work order number, firmware version, touch screen color information, supplier material code MPN, shipment

Country number Reg., Apple main processing chip ID number, etc.). The test fixture then communicates via RS232

The protocol sends test instructions to the UUT (Unit Under Test) to test whether each chip and material

Able to respond accordingly to the excitation signal corresponding to the test instruction. QT0A mainly tests I/O port

Whether it can be switched to various modes normally, whether all button functions are normal, internal and external MIC, SPK, HP

Whether it can work normally after initialization (including whether the channel can transmit signals normally, whether the components can

Whether it can perform normal sound-to-electricity and electro-acoustic conversion, and whether it can achieve sound effect switching through remote buttons), etc. QT0B

Tends to test whether the I/O port can transmit video signals normally, battery related parameters during the test

Is it normal (including Cycle Count, battery saturation capacity FCC, battery maximum capacity

Quantity Qmax, static parameter Static Parameter, sleep enable control bit Sleep Enable Bit, firmware version

This FW Version, etc.), and verify whether the radio frequency chip and sensor chip can interrupt, wake up and

The ability to process simple test signals, etc.

Main Test Item&Description Of QT0A&B Station（1）		
No	**Test Items**	**Description**
1~3	SN/Fixture Init/Enter Diag	讀機台SN/治具初始化/進入Diag模式
4~5	Check Battery Level Before Test/Sealing Status	檢測電池電量的百分比/密封性
6~7	Diag Version/Get Board ID	讀取Daig版本/獲取主板ID號
8	Get expected Unit Configuration fromSFC	驗證機台SN與SFC中的SN的一致性
9	Read Back MLBSN and Check	讀機台主板SN并與SFC中SN對比.
10~11	Burn sysSN/sn	將系統SN寫入機台/讀取系統SN
12~13	Network CB：check previous CBs/Fatal Error	檢測前序工站CB/機台是否多次不良
14~15	WO SN/Get SENSORSN	讀取機台工單號/感應板序列號
16~17	Get BATTERYSN/Read Back NAND ID	讀取電池SN/讀取NAND ID號
18	Burn FCMB/Burn BCMB	將燒錄前/后攝像頭數據到系統
20~21	Check Front/Back Camera SN with SFC	對比前/后攝像頭SN是否與SFC一致
22~23	Burn Front/Back Camera Barcode	獲取前/后攝像頭條碼并寫入機台
24~25	Burn/Read Back HW configuration	將硬件配置信息寫入機台并讀出.
26	NAND Size Check between syscfg and unit	讀取內存大小并對比系統配置比較
27~28	Burn Device Color/Burn Matrix and Special builds	將 Matrix 和 S-build資訊/顏色燒入機台
29~32	Burn/Read back MPN&Regn	將廠商物料編號&國別號寫入機台并讀出
33~34	Write Hardware Version/date and Time	寫入硬件版本/時間和日期
35~36	Battery FW Ver.Check/Read Back AP CHIP ID	檢查電池固件版本/讀主處理芯片ID號
38~41	Menu/Hold/VolUP/VolDn/Ringer Button Test	測試菜單/電源/音量加減/靜音功能
42~43	Fixture Enter/Enter ByPass Mode[No Accessory]	測試治具/機台進入Bypass模式
46~47	Acc Power Off/Fixture Exit/Exit ByPass Mode	關ACC電源/測試治具&機台退出Bypass模式
44&48	ReadBack Bypass Current(mA)[90,110/270,330]	讀取旁路模式電流（ByPass和非Bypass）
49~50	Acc 3.3v power on/DP hot plug detect	打開ACC電源/檢查DP熱插拔接口
51~53	Acc power Turn off/FW（non） presence	關閉ACC電源/檢查非固件
54~56	USB Present - Open/Close/DFU File Transfer	打開/關閉USB/DFU協議傳輸
57~58	HP non-presented/Open Mic test	耳機測試/外部MIC狀態檢測
59~60	Ext. MIC non-presented/Acc Det-open	外部MIC檢測/打開ACC端口
61~63	Acc ID-open/Det-close/ID-close	ACC ID打開/端口關閉/ACC ID關閉

Main Test Item&Description Of QT0A&B Station（2）		
64~65	Mikey WDMic Test HP Left/Right	測試聲音外部MIC到耳機左/右聲道回路
66~70	Mikey_Tone_S0/S1/S2/S3/S4	Mikey對音效切換功能是否良好
71~73	HP Detect/Int Mic Test/Ext. MIC present	耳機檢測/內部MIC測試/外部MIC檢測
74~75	HP Detect (from Mikey1A)/1K Tone To Hp	通過Mikey電流檢測耳機/1K信號到耳機
76~78	Int Mic To HP Echo/1K Tone To Left/Right Spk	內MIC到耳機回路/1K信號驅動左右喇叭
79~81	Lineout - Left/Right/China Headset Detect	LineOut左右聲道測試/檢測中國耳機
82~85	Back/Front Camera Find&DLI	查找后前攝像頭/數據傳輸完整性測試
86~87	Hall Sensor Miss/Detect Test[miss/detect]	霍爾感應MISS/Detect測試
88~89	Write QT0a CB/Check Battery Level After Test	寫入QT0a控位/檢查測試后電池電量
90	Load WiFi&BT firmware&power_on Baseband	打開WIFI/BT 3G模組電源并下載固體信號
7~30	DP HotPlug Detect Sleep Test/DP Test	顯示端口熱插拔休眠/數據傳輸檢測
33~35	BT Auto/Sleep/Host Wake Test	藍牙模組自動檢測/休眠&主喚醒檢測
36~37	Wifi Host Wake Test&UART TEST	無線局域網主喚醒/異步接收&發送數據測試
38~39	Wifi HSIC-DEVICE/HOST-READY	無線局域網高速集成芯片測試
41	J2/A and x26/A Bonding check	測試主板和3G模組之間數據傳輸
42	Read Back x26SN and Check with SFC	讀取3G模組SN號并與SFC系統比對
43~44	Burn x26/x26A SN / X26 Firmware Version	在主板中燒錄3G SN/讀3G固件版本
45~47	Sim Tray&card Test / Compass Present	檢測SIM卡及其託盤/指南針功能測試
48~50	Sensor Accel X[-150,150]/Y[-150,150]/Z[-2000.0]	通過X,Y,Z三軸數值判斷加速計性能
51~54	Accel Intr/Check Prox IC With Register 0*81~0*98	加速計中斷測試/接近式感測器性能測試
55~57	Prox Short/Open Test/Battery Present [3400,4200]	接近式感測器短&開路測試/電池檢測
58~60	NTC [3027,4200]/Battery Chem ID（Seal）	電池負溫度係數測試/ID檢測
61~63	Battery Static Parameters（Sealed）/Check Sum	電池靜態參數測試（密封狀態）
64~65	Battery Check FCC [1.1K,1.3K]/Qmax [1.1K,1.5K]	電池飽和容量/最大容量測試
66~68	Battery Cycle Count [0,5]/FW version/Check QEN	測試電池循環次數/固件版本
69~71	Check sleep Enable Bit(Seal status)/GG Enhancement	測試電池休眠使能控制位/能源管理電路
72~77	Read PMU Temperature Seneor 1~6	讀取電源管理單元溫度感測器數值
78~79	Grape Digital Open Test/Critical Error Test	觸摸屏數據端口開路/臨界誤差測試
80~81	Unit ShutDown Auto/Write PDCA	機台自動關機并將測試結果上傳至PDCA

(1), DFU: Firmware forced upgrade and downgrade mode. The biggest difference between recovery mode and DFU mode is that

Whether to start iboot, enable iboot for firmware recovery and upgrade in recovery mode, and enable iboot in DFU mode

The system does not start iboot, so the firmware can be downgraded in DFU mode.

(2) Matrix information: Matrix of Apple's export-compliant products and countries. are their respective export control points

Class number (ECCN). License exceptions applicable under the U.S. Department of Commerce Export Administration Regulations, technology

and a list of conditions.

(3) Mikey: Remote button detection chip, mainly used to detect button signals on the headphone line, thereby

Control the audio processing chip to switch the system's sound effects.

(4), NVM: non-volatile memory, which can realize convenient read and write operations. For read operations, NVM

The data in it is the same as RAM. You can directly reference its address. The erasing and writing operation is much more complicated. Generally

This needs to be done using the function library and driver provided by the manufacturer.

(5) HotBar: hot press molten tin soldering, first print the solder paste on the PCB board, and then use heating to

Solder melts and connects two electronic components that need to be connected. It is usually used to connect flexible circuit boards (FPC).

Welded on the PCB board, this can achieve the purpose of being light, thin, short and small. HotBar heat press machine

It is heated by Joule heat generated when a pulse current flows through materials with high resistance properties such as molybdenum and titanium.

(6) BASEBAND: In the IPAD series products, the baseband is the component that manages wireless communications. base

The belt contains a communication system for controlling the communication program in the IPAD. This program controls phone calls.

communication, wireless LAN and Bluetooth communication.

3. Connectivity 1&2

After assembling the GRAPE and LCD interface, control the reading and

GRAPE and LCD related configuration information are programmed into the motherboard, and then the components (Grape&LCD) are tested.

and lower component (HSG) connectivity. Connectivity 1 mainly tests the basic performance of Grape and Grape

Whether data transmission can be performed normally with MLB, Connectivity 2 inputs the driving signal

Light up the LCD and check whether the LCD can switch and display the screen normally. The LCD display screen is

Whether there are dirt, foreign objects, spots, water ripples, light leaks and other defects, whether the camera can preview normally, etc.

Prevent related screen test defective materials from being pressed into the complete machine.

Main Test Item&Description Of Connectivity 1&2 Station		
No.	**Test Item**	**Description**
1~3	Enter Diag/SN/Connect SFC	進Diags模式/讀SN/連接SFC系統
4~7	Burn/Read Back MPN&Regn	燒寫并讀取廠商物料編號及國別號
8~9	Check EEPROM Version/Burn LCD SN	讀取EEPROM版本信息/燒寫LCD SN
10~12	Burn&Read Back Grape SN/ALS Interrupt	燒寫并讀取Grape SN/ALS中斷測試
13~14	Prox Temperature/Grape Critical Error	讀Prox芯片溫度/觸摸屏臨界誤差測試
15~17	Grape Offset Test/GRAPE_RAW_MIN & MAX	Grape與MLB之間數據傳輸測試
18~19	GRAPE_COL_SLOPE_MIN & MAX	Grape傾斜度測試
20~22	GRAPE_ROW_AVG_DELTA/UNIF_MIN & MAX	Grape均勻度測試
23~25	Grape Ground Shield/Sensor ALS Bright	觸摸屏接地測試/ALS兩通道感光測試
26~27	EDP BER Test/Check Panel ID	內置顯示端口控制位測試/檢測面板ID號
28~29	Read Back CLCD ID/Check LCD Vendor	讀取LCD ID號并檢測LCD廠商
30~31	All/Home Button Test	電源/靜音/音量加減/靜音/菜單鍵測試
32~35	Front/Back Camera DLI&Preview	前後攝像頭數據完整性測試及攝像預覽
39~40	COG BERT/Waterfall Test	數據傳輸誤碼率測試/水波紋測試
41~42	CLCD Pattern test/Light Leakage Test	LCD畫面測試/LCD漏光測試
43~44	Write Connectivity CB/Unit ShutDown	寫連接性測試工站控制位/機台關機

4. SW/DL ÿSoftware Downloadÿ

The SW/DL station mainly erases the Diags pattern downloaded before the quick test and re-downloads the new one.

Diags mode, OS [Operation System] mode and Inforno, Grape Cal verification data

and other information to provide software support for subsequent workstation testing of the specific performance of the complete machine. OS mode main control circuit

and the chip operates on the input signal according to a certain logical relationship, and outputs the corresponding target

The signal drives the peripheral device to respond accordingly. SW/DL work station download software needs to meet the following conditions

Parts: (1) The machine voltage is above 3.75V.

(2) The machine can be started normally.

(3) The machine is in shutdown state or iboot mode.

After plugging in the USB cable on some machines, the download interface stops when it reaches 'DiagOverUSB'.

This type of machine needs to press the power button and menu button at the same time until it can run normally before continuing to download.

5. Burn In

Burn-in test, by continuously running the test program to detect the stability and stability of each component of the machine

reliability. The Burn in test is mainly divided into two parts: Bonfire and Inferno. Inferno main test

Test the power consumption of the whole machine and the stability of the system functions of the whole machine. Bonfire mainly tests the storage medium (NAND

and DDR) stability. Compared with inferno, Bonfire takes a long time and does not have a separate project test.

Try the command. However, the bad code returned after the FAIL test is confirmed, and the cause of the badness is easy to find, and the bad phenomenon

Easy to determine. Inferno testing takes a short time and can be quickly verified; there are many test items, causing undesirable results.

It is not easy to determine the cause, and it is more complicated to determine the adverse phenomenon. The following are the main test items of the Burn In workstation

and its explanation.

Burn In Station Test Items and explanation	
CpuAvailable	檢測機台CPU的使用率是否能達到70%或更高
Temperature	檢查機台各個部分溫度是否在值域範圍內
Component	檢測傳感器，記憶體，無線通信固件等物件是否存在
Graphics	檢測圖像處理單元是否存在及能否正常處理數據
Current	檢測機臺運行時各個組件上的電流是否符合標準
Accelerometer	檢測加速計三個座標軸上感應數據是否符合標準
Mp4v	對MP4V文件解碼並將解碼結果與標準樣本比對
H263&H264	編碼解碼 H263,H264文件並將結果與標準樣本比對
TVOut	通過向幀緩衝器寫視頻輸出數據檢測視頻輸出狀況
Sleep&Reboot	檢測機台能否正常休眠及重啓以及各組件是否存在
WakeOnWifi	檢測無線局域網固件的正常激活及其功能
BatteryCapacity	驗證電池最大容量是否能達到設計值的86%~128%
SDIOCheck	檢查系統Log中是否有錯誤或特定錯誤字符串
LCDMura	檢測液晶顯示屏有無缺陷並將背光亮度調節至50%
Charge&Discharge	檢測機台插入電源適配器能否充電，順利重啓及耗盡電量

Inferno Tests Status (1)		
Tests	Actions	Description
Bonfire	Checks result of Bonfire	
	1. Bonfire	Returns the Bonfire return code from /AppleInternal/Diags/Logs/Bonfire/result.txt
Battery Charge Discharge	Various Battery Tests	
	1. BatteryTest -t 1	InstalledTest - checks that a battery is present
	2. BatteryTest -t 6	ACAdapterConnectedTest - checks that a charger is present
	3. Unload CommCenter	Unloads CommCenter
	4. Sleep 2	Sleeps 2 seconds
	5. BatteryTest -t 41	NoDrainTest-checks battery does't drain with AC connected and charging disabled
	6. Reboot	Reboots the unit
	7. FactoryBootCheck	Check that the reboot completed succesfully
Cpu Available	Checks that the cpu % available	
	1. CpuAvailable	Checks that the cpu % available to the unit is 70% or higher
Baseband Crash	Check for baseband crashes	
	1. BasebandCrashCheck	Checks baseband crash logs in /var/wireless/Library/Logs/CrashReporter/Baseband
	2. BasebandCrashCheck	Checks baseband crash logs in /var/wireless/Library/Logs/CoreTelephony/Trace
Temperature	Check temperature on unit	
	1. Temperature	Check temperature for various thermistors on the unit to be within set limits
Component	Component check	
	1. Component	Checks for the following components
		Bluetooth/Wifi/Compass/GasGauge/LCD/Grape/DDR Info/Nand Info/Gyro
		Thermistors/Baseband (if K94)/GPS/ALS/Accelerometer/Front&Rear Camera
Graphics	Checks the graphics sub-system	
	1. GLES2BurnIn	Runs SpinningIPhone and checks for errors. Tool maintained by the graphics team
Current	Check current usage of the device to be within set limits	
	1. Unload CommCenter	Unloads CommCenter
	2. Sleep 2	Sleeps 2 seconds
	3. Powermode 2	Audio Mode - checks current usage while playing audio
	4. Powermode 0	ThermalVirus Mode - check current usage while running thermalvirus
	5. Powermode 7	Charging Mode - checks that battery is not draining when charging
	6. Reboot	Reboots the unit
	7. FactoryBootCheck	Check that the reboot completed succesfully
Accel	Checks the Accelerometer for stuck axis readings	
	1. AccelerometerTest	Checks that Average Magnitude of the x,y and z axis readings are 1.005 +/- 0.285
Mp4v	Checks Mp4v functionality	
	1. goldenVideo	Decodes a mp4v file and compares the results with good golden samples.
H263	Checks H263 functionality	
	1. goldenVideo	Decodes a h263 file and compares the results with good golden samples.
H264	Checks H264 functionality	
	1. goldenVideo	Decodes a 720p h264 file and compares the results with good golden samples.
	2. GoldenH2VideoEncoder	Encodes a 960x544 h264 file and compares the results with good golden samples.
	3. GoldenH2VideoEncoder	Encodes a 1280x780 h264 file and compares the results with good golden samples.
TVOut	Checks TVOut functionality	
	1. TVOutTest	Tests TVOut by writing to the TVOut frame buffer.
Sleep	Sleep Cycler stress testing	
	1. BasebandCrashCheck	Check if baseband crashed (K94 only)
	2. SleepCycler	Sleeps unit for 10 seconds
	3. Component	Component check (See list of component checked)
	4. BatteryTest	Not a test. Saves battery level to battery.plist for PDCA logging
	5. BasebandCrashCheck	Checks baseband crash logs in /var/wireless/Library/Logs/CrashReporter/Baseband
	6. BasebandCrashCheck	Checks baseband crash logs in /var/wireless/Library/Logs/CoreTelephony/Trace
	7. mv/Logs/CrashReporter	Move CommCenter crash logs (if any) to Inferno folder for log collection

Inferno Tests Status (2)		
Reboot	Reboot Cycler stress testing	
	1. BasebandCrashCheck	Check if baseband crashed (K94 only)
	2. Reboot	Reboots the unit
	3. startLocmon.pl	Launch locmon for GYTT collection
	4. FactoryBootCheck	Check that the reboot completed succesfully
	5. Component	Component check (See list of component checked)
	6. BatteryTest	Not a test. Saves battery level to battery.plist for PDCA logging
	7. BasebandCrashCheck	Checks baseband crash logs in /var/wireless/Library/Logs/CrashReporter/Baseband
	8. BasebandCrashCheck	Checks baseband crash logs in /var/wireless/Library/Logs/CoreTelephony/Trace
	9. mv/Logs/CrashReporter	Move CommCenter crash logs (if any) to Inferno folder for log collection
WakeOn Wifi	Check Wake-on-Wifi functionality	
	1. WifiSleepClockTest-w	Check that the wake-on-wifi gpio is working
Battery Capacity	Various Battery Tests	
	1. BatteryTest -t 1	InstalledTest - checks that a battery is present
	2. BatteryTest -t 6	ACAdapterConnectedTest - checks that a charger is present
	3. BatteryTest -g 95	Not a test. Charges battery to 95%
	4. BatteryTest -t 19	Checks Max Capacity of Battery to be 86% to 128% of Design Capacity
SDIO Check	Check for error/fatal messages in syslog	
	1. KPCheck	Checks for specific error strings in syslog.txt for SDIO failures
LCDMura	Checks screen for Mura defects	
	1. Load LCD Mura	Load the LCD Mura Test. Requires operator interaction to check for mura issues
	2. Unload LCD Mura	Unload the LCD Mura test
	3. LCDTest -g	Check Mura test results
	4. setbright 256	Set backlight back to 50%
Gyroscope Setup	Setup GYTT key generation	
	1. memdump -d GYTT	Delete any existing GYTT key
	2. Reboot	Reboot the unit
	3. gyroSetup.pl	Setup CoreLocation for GYTT data collection
Gyro TearDown	Complete the GYTT key generation	
	1. gyroTemp.sh	Log gyro temperature
	2. ThermalDOE -t 600	Run max thermal virus for 10 mins
	3. gyroTemp.sh	Log gyro temperature
	4. ThermalDOE -t 600	Run max thermal virus for 10 mins
	5. gyroTemp.sh	Log gyro temperature
	6. killall locmon	Kill locmon
	7. Unload locationd	Unload locationd
	8. BuildGYTT	Write the GYTT key from the gyroCal.db file
Inferno DCT	Darwin Compile Test	
	1. startCompileXNU 100	Do 100 iterations of gcc compilation
Acoustic Sense	AcousticSense Gyro resonant frequency characterization	
	1. setVirtualAudio.pl disable	Disable Virtual Audio
	2. AcousticSense -R	Log ODR Frequency
	3. AcousticSense Chirp	Run Gaussian Chirp test
	4. AcousticSense Warbler	Run Warbler test
	5. setVirtualAudio.pl enable	Enable Virtual Audio

H.264: It is a new type of video compression technology. Video compression by reducing and removing redundant video

Data method to achieve the purpose of effectively sending and storing digital video files. H.264 is MPEG-4

The tenth part of ITU-T Video Coding Experts Group (VCEG) and SSO/IEC Dynamic Image Experts

The high voltage proposed by the Joint Video Team (JVT: Joint Video Team) jointly formed by the MPEG

Reduced digital video encoding and decoding standard.

H.264, like previous standards, is a hybrid coding mode of DPCM plus transform coding. but it

Adopting a simple "back to basics" design, you can get much better results than H.263++ without numerous options.

Excellent compression performance, enhanced adaptability to various channels, and a "network-friendly" structure and algorithm

This method is beneficial to the processing of bit errors and packet loss, and has a wide application range to adapt to different rates and different solutions.

resolution, and the needs of different transmission scenarios. H.264 is divided into two layers in algorithm concept: video encoding layer

(VCL: Video Coding Layer) is responsible for efficient video content representation; Network Extraction Layer (NAL:

Network Abstraction Layer) is responsible for packaging and transmitting data in the appropriate manner required by the network.

deliver. The H.264 encoding and decoding process includes five parts: inter-frame and intra-frame prediction (Estimation), transformation

(Transform) and inverse transformation, quantization (Quantization) and inverse quantization, loop filter (Loop Filter),

Entropy Coding.

3.3. IPAD3 audio module test

Final Acoustic Test (FACT): FACT test

The test is usually conducted without speakers. On the one hand, it must pass

The sealed box isolates external signals from interfering with the test system.

On the other hand, foam is inlaid around the non-speaker box so that the sound emitted by the test equipment and the machine under test can be measured

After the test, it is quickly attenuated and eliminated to prevent the generation of standing waves and interference with normal tests. The picture above shows the IPAD audio test.

The internal structure of the test box consists of two standard MICs and a standard SPK.

During the test, after clicking the START icon on the test screen with the mouse, the PC will

Send instructions to the unit under test (UUT) to drive the SPK on the UUT to sound or initialize the MIC.

initialization. When testing the MIC, initialize the MIC of the UUT and the standard SPK on the fixture will sound.

After the MIC on the UUT and the standard MIC on the fixture are received, the audio signal passes through the B&K amplifier

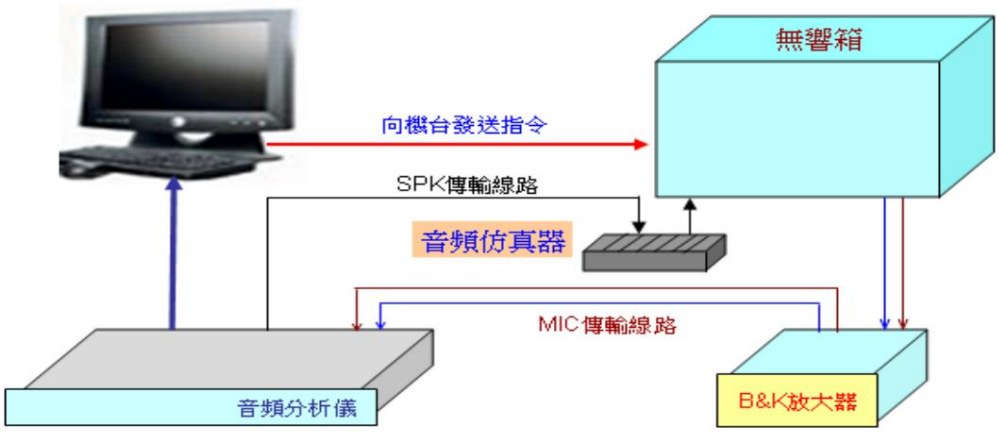
The incoming audio analyzer performs corresponding operations on the test signal and outputs the result to the display; test SPK

When, the SPK on the machine makes a sound under the excitation of the driving signal, and the MIC on the fixture close to the SPK on the machine absorbs

sound, perform corresponding operations on the obtained sound and the sound just obtained from the standard SPK, and then

The calculation results are output to the display. There are three main test parameters at the FACT station: frequency response, harmonic

Wave distortion, and signal-to-noise parameters. The three parameters will be briefly introduced below.



(1). Frequency Response (Frequency Response)

Frequency response mainly evaluates the UUT's ability to restore various frequency points of the audio signal. Generally speaking,

The audio signal contains relatively rich wavelet components (the signal is converted from the time domain to the

The frequency domain can be reflected more intuitively). Only when these wavelet components are completely restored, the synthesized signal can

It will be exactly the same as the original audio signal (that is, there will be no distortion in the system). But in reality, the human ear does not

The sensing range of the signal is between 20HZ and 20000HZ (ultrasonic and infrasound waves cannot be detected by human ears).

It is impossible and unnecessary for the subsystem to perform linear restoration without distortion for all wavelets at each frequency point. because

In theory, the frequency range of this amplifier should be 20-20kHz (±3dB), which is enough, but in fact

Many musical instruments or reflected overtone harmonics contained in music are outside this frequency range. Depend on

The accuracy of sound discrimination by the human ear can reach 0.1dB. The frequency response of some advanced amplifiers is nominally

The non-uniformity of 20-20kHz is plus or minus 0.1dB, when measured with ±3dB non-uniformity their time-frequency

The response may be 10Hz to 50kHz or even wider. For the purpose of improving transient response, the amplifier

There should be a wider frequency response range, such as the frequency response range of new generation audio sources SACD and DVD Audio.

Beyond the traditional 20kHz, the frequency response of modern advanced amplifiers can reach from 10Hz-100kHz (±

3dB). However, the frequency response of the amplifier is not as wide as possible, otherwise it is easy to introduce high-frequency or low-frequency interference.

Reduce S/N or induce intermodulation distortion. There should be two strict frequency response curves, in which we

A common frequency response diagram is called an amplitude-frequency curve, and the other is called a phase-frequency curve, which represents different

The size of the phase distortion (phase distortion) produced by the frequency after passing through the amplifier. Phase distortion refers to the signal

The time phase difference generated from the amplifier input end to the output end. If the phase difference is too large, it will affect the negative feedback line.

The stability of the circuit is closely related to the phase distortion and transient intermodulation distortion. The Hi-Fi amplifier

Phase distortion should be controlled within ±5% within the frequency range of 20-20KHz.

(2).Total Harmonic Distortion

Harmonic distortion is used to evaluate the amount of additional noise introduced into the audio signal after it is processed by the system.

After an object is disturbed and vibrated by the outside world, it will undergo a periodic attenuated vibration. For example, both ends are fixed

When the string is plucked in the middle, it will produce a large vibration visible to the naked eye. This vibration is called the fundamental

Wave (Fundemental), in addition to the large swing of the string along the midpoint, the line itself also has a lot of flesh.

Small vibrations that are difficult to see with the eye. Their frequencies are higher than the fundamental wave. These vibration frequencies are called harmonics.

(Harmonics), the harmonics produced by musical instruments are often called overtones. In addition to being generated by the signal source

In addition to harmonics, the reflection, diffraction and refraction caused by obstacles when propagating sound vibration waves will also produce harmonics.

Wave. In addition, the various electronic components, wiring, and solder joints in the amplifier circuit will

Reduce the linear performance of the amplifier. When the music signal passes through the amplifier, the nonlinear characteristics will cause the signal to

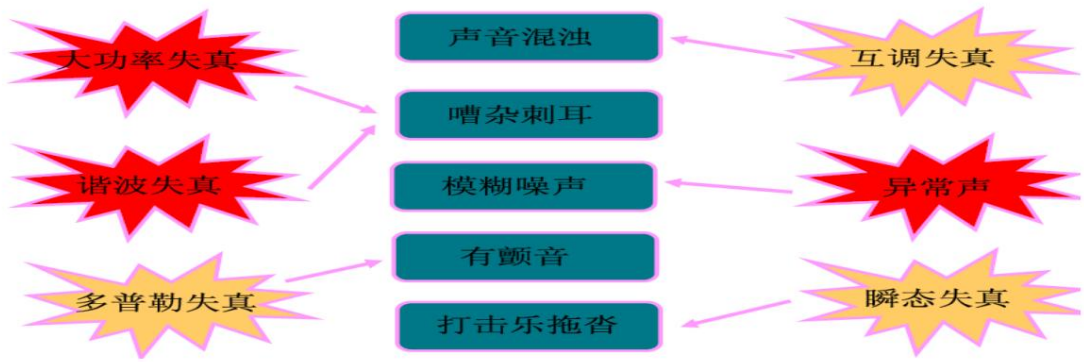
A certain degree of deformation and distortion occurs, which is equivalent to adding some harmonics to the signal. This signal deformation

The distortion is called harmonic distortion. Harmonic distortion is generally measured as the ratio of the root mean square value of the harmonic component to the fundamental wave.

To express, the smaller the percentage number is, the less harmonics generated by the amplifier, which means that the distortion of the signal waveform is

Really low. The following is the relationship between acoustic evaluation parameters and subjective feelings of the human ear.

(3).Signal Noise Ratio



Signal-to-noise ratio is the abbreviation of signal-to-noise ratio. It refers to the ratio of signal level to noise level. Usually

In decibels (dB), when the signal-to-noise ratio is 100dB, the output voltage is ten thousand times the noise voltage.

In addition to signal-to-noise ratio, amplifier noise can also be expressed by noise level, but this method uses

The signal-to-noise ratio value calculated by voltage, its denominator is a fixed 0.775V, and the numerator is noise

voltage, therefore, the noise level it derives is an absolute value, while the signal-to-noise ratio is a relative value.

If the signal-to-noise ratio index of the amplifier is high, the music background played back will be quieter.

At low level, many weak sound details that were originally hidden by the noise will be revealed, enhancing the sense of air and making the dynamics more dynamic.

Range increases. Generally speaking, the signal-to-noise ratio of the amplifier must be above 85dB to have a better listening experience.

At this value it is possible to hear noise during musical breaks. Since signal-to-noise ratio is logarithmic to power or voltage

relationship, to improve the signal-to-noise ratio, it is necessary to increase the ratio of signal level and noise level, but this is in engineering technology

It is not an easy task.

(4).Inter modulation distortion (Inter modulation Distortion)

Simply put, the synthesized signal is called a modulated signal, and intermodulation distortion refers to the high-frequency distortion in the entire audible frequency band.

Distortion caused by the process of mixing low frequencies into full frequencies. The process of producing intermodulation distortion is actually a kind of modulation

process, this is because each electronic circuit or each amplifier produces signals at different frequencies under the action of nonlinearity.

The signals will be added and subtracted automatically to produce two additional signals that are not in the original signal. When the original signal is

When N, there will be 3N output signals. It can be imagined that the interference caused by intermodulation distortion in the audible frequency band

The amount of extra signals is staggering. Since all intermodulation distortion signals are the addition and subtraction of music frequencies,

signal, so the human ear is more sensitive to it, although intermodulation distortion and harmonic distortion are caused by the amplifier

Caused by nonlinearity, both add some additional frequency components to the sine wave, but their properties are different.

No, harmonic distortion is a distortion of the original signal waveform. It is a single frequency signal that is amplified

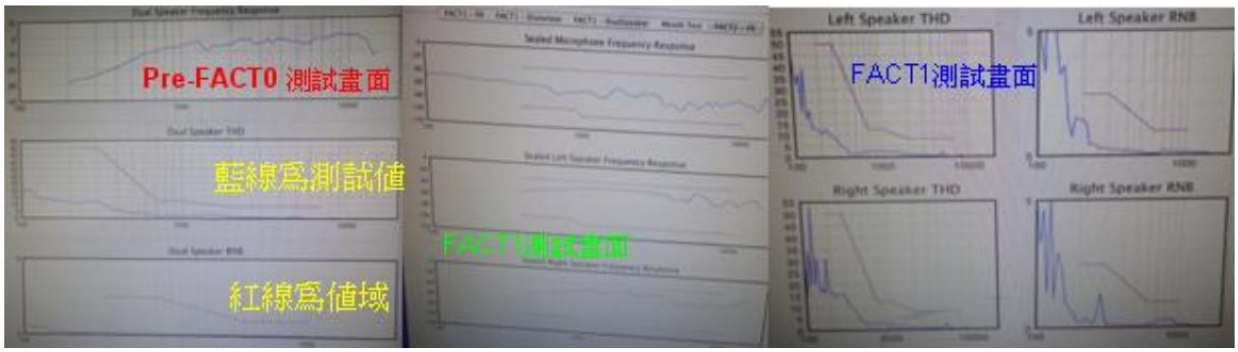
Lines will also produce distortion, but intermodulation distortion is caused by mutual interference between different frequencies. Amplification

The intermodulation distortion in the converter is often larger than the harmonic distortion, and its measurement is far more complicated than the harmonic distortion.

Today there is still no unified measurement standard. To significantly reduce intermodulation distortion, electronic frequency division can be used to

Limit the operating frequency band of each amplifier and speaker.

1. Pre-FACT1ÿPre-Final **Acoustic Testÿ**



After assembling the MIC, test the SPK monomer function and the air tightness of the MIC. Verify SPK and

Whether the function and assembly of the MIC body are in good condition. MLB is embedded on the device because MLB is not assembled

Provide audio driving signals to SPK and process the corresponding signals. During testing, the MIC absorbed sound

The hole needs to be sealed. When the MIC is well assembled, there are no gaps at the edges of the MIC and HSG, and the audio

Signals will not enter the MIC from the edges and be absorbed by it. Since the MIC sound-absorbing hole is sealed, the machine

The signal received by the MIC on the desk is much smaller than the signal received by the standard MIC (unsealed). Above picture

It is the value range of the ratio between the two according to the corresponding logarithm operation. When the values of each frequency point are within the value range

Within, it means that the MIC assembly meets the requirements. The SPK test is the same as the FACT1 station.

2.FACT 1 ÿFinal Acoustic Test 1ÿ

It mainly tests the acoustic performance of MIC and SPK after synthesizing the whole machine. During testing, MIC and

SPK does not need to be sealed. When the audio analyzer receives the signal, it will control the frequency selection according to the test procedure.

The signal of some frequency points between 100HZ ~10000HZ is calculated, and then the signal of the sampling frequency point is calculated.

the response intensity of these points, and fit the response values of these points into a curve to observe whether the response values of each frequency band

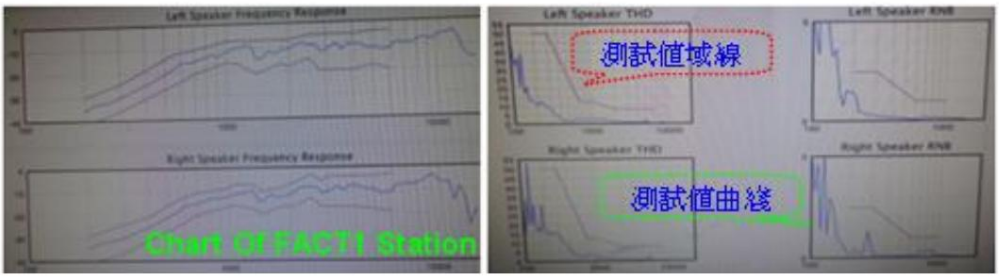
reaches the predetermined value, and the response of a certain segment does not meet the requirements, it means that the UUT cannot fully respond to the signal in this frequency band.

Restored, that is, the SPK or MIC function of the machine is malfunctioning. Frequency response mainly evaluates UUT's signal restoration

The merits and demerits of abilities. Harmonic distortion mainly evaluates whether the UUT interferes due to reflection during the signal response process.

Diffraction produces standing waves, high-order odd harmonics and other dispersion components that affect the sound effect. The main signal-to-noise parameters

Check whether the ratio of information content and non-information content in the sound signal processed by UUT is within the standard range.



2. FACT 2 ÿFinal Acoustic Test 2ÿ

Check the assembly status of MIC and SPK modules by testing the air tightness (Sealed) of MIC and SPK.

condition. The test principle and test parameters are the same as FACT 1. During the test, the MIC is separated by an isolator.

The sound-absorbing hole and the SPK sound-output hole are sealed, and then the machine SPK and the standard SPK are driven to produce sound. Through calculation

Observe whether its response value at each frequency point between 100HZ~10000HZ is within the standard range (than the free

(the state value is much smaller), if it exceeds the value range, it means that there is a gap in the SPK assembly, and the sound can come from the gap.

leakage into the system. When testing a MIC, if the response exceeds the standard value range, the MIC is defective.

There are gaps between the glue and HSG, and stray audio signals inside the system can leak into the suction system through these gaps.

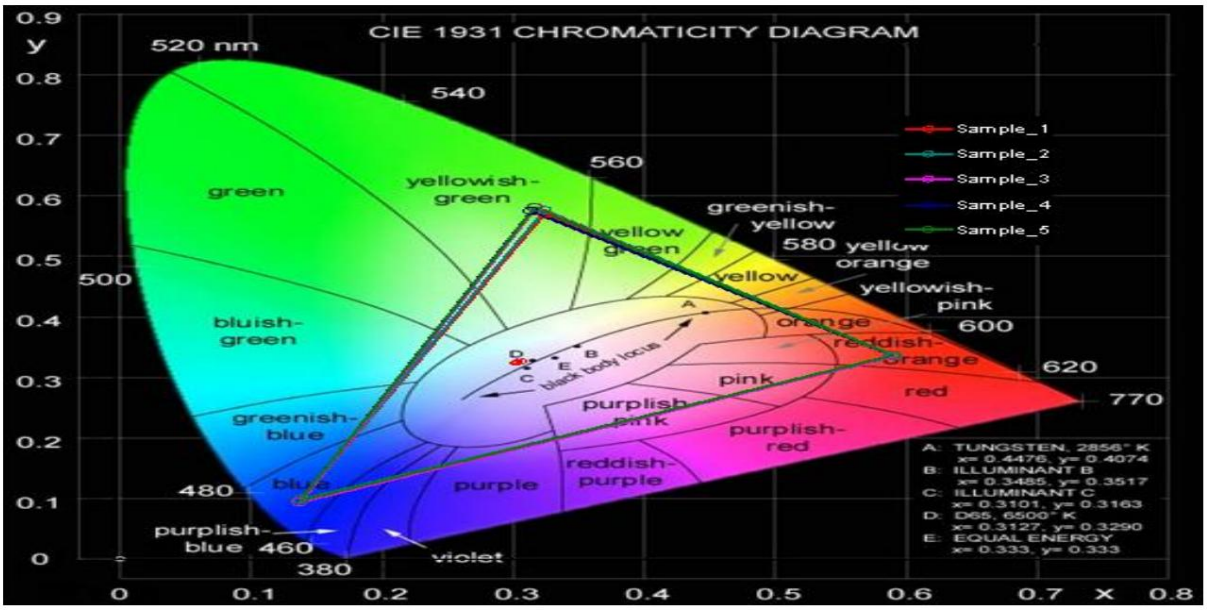
FACT1&FACT2 Station Test Item		
No.	**Test Item**	**Description**
1	(Sealed) Microphone FR@1000&FRMask	非（密封）時在1000HZ&[100~10000HZ]的頻率響應
2	(Sealed) Left Speaker FR@2000FR&Mask	非（密封）時左SPK在2000HZ&[100~10000HZ]的頻率響應
3	(Sealed) Left Speaker THDMask	非（密封）時左SPK在2000HZ&[100~10000HZ]的諧波失真
4	(Sealed) Left Speaker RNBMask	非（密封）時左SPK在2000HZ&[100~10000HZ]的信噪參數
5	(Sealed) Right Speaker FR@2000&FRMask	非（密封）時右SPK在2000HZ&[100~10000HZ]的頻率響應
6	(Sealed) Right Speaker THDMask	非（密封）時右SPK在2000HZ&[100~10000HZ]的諧波失真
7	(Sealed) Right Speaker RNBMask	非（密封）時右SPK在2000HZ&[100~10000HZ]的信噪參數

sound hole. A simple example is that after the MIC of the complete machine is tested FAIL at the FACT2 station, the MIC

Initialize, then seal the MIC sound-absorbing hole with your finger, and you can hear the beep from the SPK.

This shows that the MIC absorbs the stray signals inside the machine.

3. BUY (Multi Audio & Video Test)



The MUAV station comprehensively tests the quality of audio/video signals and the impact of related electronic circuits on audio signals and

Video signal processing capabilities. The test equipment generates a test signal. After it is transmitted to the UUT, the U3600

The frequency signal is processed accordingly, and the processed signal is transmitted to the test instrument for analysis and calculation.

The processing results can be used to determine whether there is crosstalk in the left and right channels, and whether the signal-to-noise ratio of the data transmitted on each channel meets the requirements.

Meet the requirements, whether harmonic distortion occurs during audio signal processing and transmission, etc. For video, the main test is

Try to output luma and chroma. During testing, the UUT generation format is PHL.

and NTSC standard TV test signals, transmitting brightness signals and chrominance signals through three channels respectively.

and the mixed signal of brightness and chrominance, and finally the signal output through the video channel is transmitted to the device for processing.

Perform synthesis and analysis operations to detect white, yellow, and red through amplitude and phase

No.	Test Items	Description
1	Station info version	檢查工站測試版本
2	Station info station temperature	檢查工站測試溫度
3	Serial number serial number readback	讀取測試機台序列號
4	Acquire Video Signal Detect Video Signal Portrait Ch1Ch2/Ch3	從通道1/2/3分別獲取并檢測視頻信號
5	SC Frequency Sub-Carrier Frequency Portrait Ch1/Ch2/Ch3	從通道1/2/3獲取子載波信號頻率
6	H-TiminG Sync Amplitude Portrait Ch1/Ch2/Ch3	通道1/2/3同步信號幅度
7	H-TiminG Burst Amplitude Portrait Ch1/Ch2/Ch3	通道1/2/3突發信號幅度
8	H-TiminG Burst Quadrature Error Portrait Ch1/Ch2/Ch3	通道1/2/3突發錯誤信號總量
9	Color Bar Luminance Amplitude: [White] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取白色信號亮度幅值
10	Color Bar Luminance Amplitude: [Yellow] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取黃色信號亮度幅值
11	Color Bar Luminance Amplitude: [Cyan] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取青色信號亮度幅值
12	Color Bar Luminance Amplitude: [Green] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取綠色信號亮度幅值
13	Color Bar Luminance Amplitude: [Magenta] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取洋紅色信號亮度幅值
14	Color Bar Luminance Amplitude: [Red] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取紅色信號亮度幅值
15	Color Bar Luminance Amplitude: [Blue] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取藍色信號亮度幅值
16	Color Bar Luminance Amplitude: [Black] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取黑色信號亮度幅值
17	Color Bar Chrominance Amplitude: [Yellow] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取黃色信號色度幅值
18	Color Bar Chrominance Amplitude: [Cyan] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取青色信號色度幅值
19	Color Bar Chrominance Amplitude: [Green] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取綠色信號色度幅值
20	Color Bar Chrominance Amplitude: [Magenta] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取洋紅色信號色度幅值
21	Color Bar Chrominance Amplitude: [Red] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取紅色信號色度幅值
22	Color Bar Chrominance Amplitude: [Blue] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取藍色信號色度幅值
23	Color Bar Chrominance Phase (+V): [Yellow] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取黃色信號色度相位
24	Color Bar Chrominance Phase (+V): [Cyan] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取青色信號色度相位
25	Color Bar Chrominance Phase (+V): [Green] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取綠色信號色度相位
26	Color Bar Chrominance Phase (+V): [Magenta] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取洋紅色信號色度相位
27	Color Bar Chrominance Phase (+V): [Red] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取紅色信號色度相位
28	Color Bar Chrominance Phase (+V): [Blue] Portrait Ch1/Ch2/Ch3	從通道1/2/3分別讀取藍色信號色度相位

Color (Red), Magenta (Magenta), Cyan (Cyan), Green (Green), Blue (Blue),

The brightness of the black color bar, whether the brightness is within the standard range. MUAV station main information

The test parameters are as follows.

(1) MOL (Max of output power Level): Calculate the voltage value of the maximum output frequency point.

(2) FR (Frequency Range): Bandwidth, the maximum output frequency point minus the minimum output frequency point.

(3) THD+N (Total Harmonic Distortion +Noise): within the frequency range 20HZ~20KHZ

Take 5 frequency test points, add up 0.25% of each signal to get the THD value plus various frequencies

The noise is the value of THD+N.

(4) XTALK (crosstalk): Capture the audio signal at 10KHZ frequency point, and subtract the value of the left channel signal from

The value of the right channel signal is XTALK.

(5) SNR (Signal Noise Rate): signal captured within the frequency range (20HZ---20KHZ)

noise ratio.

5. MMI ÿMan Machine Interfaceÿ

Human-machine interface test, simulates the graphical operating system, and calls the playback memory by touching the icon

The stored music can be judged by human ears whether the music played by SPK is smooth and whether the sound effect meets the standards. and

Verify that after plugging in the headphones, the signal is normal between SPK and HP, external MIC and internal MIC.

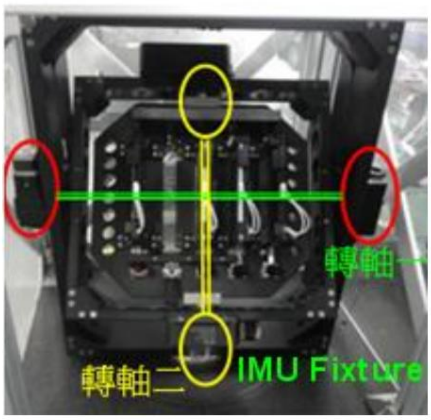
switch. Whether it is possible to adjust the volume, switch to mute state, etc. through the headset buttons or machine buttons.

3.4. IPAD sensor test

1. IMU ÿInertial Measure Unitÿ

Inertial test unit, mainly tests accelerometer (Accel) and

Specific performance of gyroscope (Gyro). During the test, pass



The motor is controlled by the microcontroller program to drive the UUT button on the fixture.

Rotating at a certain acceleration and angular velocity, the accelerometer and gyroscope chips on the machine sample the

Analyze and calculate the motion status data, transfer the processed data to the interface program, and compare it with the preset data in the program

Compare with the set standard values to evaluate the function of the accelerometer and gyroscope in detecting the motion status of the machine.

Is it normal? The main parameters tested by the IMU station are: the offset of the sensor in the three axes of X, Y, Z and

Noise, and calibrate the sensitivity of 6 planes (XY/XZ/YX/YZ/ZX/ZY).

2. QT 1 ÿQuick Test 1ÿ

Mainly tests the function and mechanism of the compass

The current of each component of the station in the non-working state,

voltage, power. The top and bottom of the fixture each have one

The coil simulates the Earth's north and south magnetic fields. During the test, the north and south magnetic fields are turned on or off.

When the north and south magnetic fields are turned on, the Sensor will sense a set of X/Y/Z values, where the north magnetic field is positive and the south magnetic field is negative.

If they are all negative values, the software will calculate the data, X1-X2=X; Y1-Y2=Y; Z1-Z2=Z.

Confirm whether the data is within the standard value range (load different currents and measure through magnetic field changes)

Compass value to determine the current location).

Main Test Item&Description Of QT1 Station		
No.	**Test Items**	**Test Item Description**
1	Get Current Log	Get current test records
2	J1&J2 State idle_hiperf Current/Voltage/Power Tests the current/voltage/power of the CPU at the highest frequency	
3	J1&J2 State Cam_Back Current/Voltage/Power	Camera current/voltage/power after test
4	J1&J2 State Cam_Front Current/Voltage/Power	Camera current/voltage/power before testing
5	J1&J2 State idle_loperf Current/Voltage/Power Test the CPU current/voltage/power at the lowest frequency	
6	J1&J2 State Speaker Current/Voltage/Power	Test speaker current/voltage/power
7	J1&J2 State LCD Current/Voltage/Power	Test LCD display current/voltage/power
8	J1&J2 State BackLight Current/Voltage/Power	Test backlight module current/voltage/power
9	J1&J2 State WiFi Current/Voltage/Power	Test wireless LAN module current/voltage/power
10	J2 State BB Current/Voltage/Power	Test baseband current/voltage/power
11	Compass [-335,475,519,-180,635,679]	Compass function test

3. ALS ARÿAmbient Light Sensor Anti-Reflectionÿ

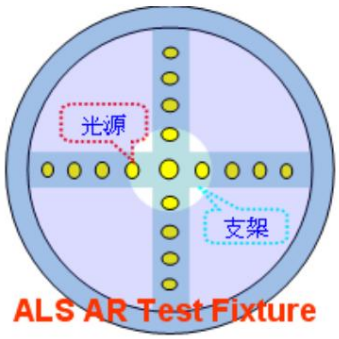
Seventeen LED lights are equidistantly distributed in a cross shape on the spherical crown and illuminated in different combinations.

On, test the ALS chip on the machine under test against LED light sources at different angles.

photosensitive ability. During the test, the LED light sources distributed on the fixture

Light up according to a certain combination sequence, and the ALS chip on the test machine passes

Through two channels (CH0: receiving natural light, CH1: receiving infrared light)



Receive natural light (including visible spectrum area and infrared spectrum area) and infrared light emitted by LED light source respectively,

Main Test Item and Discription Of ALS-AR Station		
No.	Main Test Item	Description
1~2	LED1 Ratio/ARMINMAX30theta(W) Read the LED light source angle rate/30° photoreceptor receiving maximum and minimum value ratio	
3	Peak Response Depth(WHITE)	Test the peak response depth of ALS chip to white light
4~5	Ch0/Ch1 Dark Response(WHITE)	Response value of natural light/infrared light channel to dark light source
6~7	Ch0/Ch1 Backlight Leakage Low(WHITE)	Minimum value of natural light/infrared light channel receiving backlight leakage
8~9	Ch0/Ch1 Combined BL Low(WHITE)	Minimum value of total backlight received by natural light/infrared light channel
10~11	Ch0/Ch1 Backlight Leakage Medium(W)	Backlight leakage value received by natural light/infrared light channel
12~13	Ch0/Ch1 Combined BL Medium(WHITE)	Natural light/infrared light channel The total amount of backlight received by the channel
14~15	Ch0/Ch1 Backlight Leakage High(W)	Maximum amount of backlight light leakage received by natural light/infrared light channel
16~17	Ch0/Ch1 Combined BL High(WHITE)	The maximum value of the total backlight received by the natural light/infrared light channel
18~51	LED01~17 CH0&CH1	Detect the brightness received by channel 0 and channel 1 when 17 LED lights are on

Then the obtained two channel values are subtracted to obtain the amount of visible light. The test equipment obtains the visible light through the software.

The visible light value is calculated and processed, and it is judged whether the processed data meets the standard.

52~54 ARMINMAX15theta/45theta/60theta		15°/45°/60° photoreceptor receiving maximum value and minimum value ratio

4. ALS Cal ÿAmbient Light Sensor Calibrationÿ

Photosensitive chip sensor calibration, calibrating the ALS sensor chip through different light intensity areas. exist

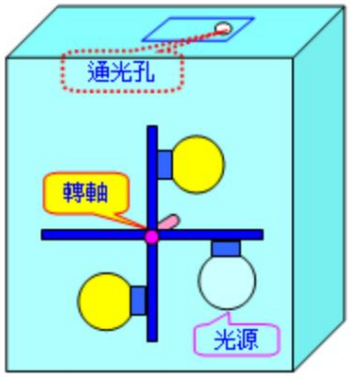
During the test, three different light sources (fluorescent lamps, bright

Incandescent lamp, dim incandescent lamp), emit light of different powers respectively,

The rotation of the orthogonal thin plates is controlled by a motor, allowing the light emitted by the three light sources to

are received by the ALS chip in turn. Convert the received data to the standard

The data is compared and the hardware is compensated through the software. And then to



Calibrate the photosensitive performance of the machine.

Main Test Item Of ALS Calibration Station		
No.	Main Test Item	Description
1~3	SN/Start Skunk/DutDeviceName	Read machine SN/Communicate with PDCA/Read device name
4~5	PreTestRunner/CheckForUnitConfig	Check the fixture/check the configuration information of the machine to be tested
6~8	ALCRunner/Data Blob/Dut Comm Status	Start testing/test data storage location/whether to test simultaneously
9~11	Lux LED/Lux Dim/Lux Incan	Fluorescent light brightness/dim incandescent light brightness/bright incandescent light brightness
12~13	Ch0 LED(BLACK)/Ch1 LED(BLACK)	Fluorescent natural light brightness/fluorescent infrared brightness
14~15	Ch1/Ch0 LED (BLACK)/Lux/Ch0 LED (B)	Brightness ratio of fluorescent lamp to natural light/brightness ratio of fluorescent lamp to natural light
16~18	Ch0/1 Dim (B)/Ch1/Ch0 Dim (BLACK)	Dark incandescent natural/infrared light value/natural to infrared brightness ratio
19~21	Ch0/1 Incan (B)/Ch1/Ch0 Incan (BLACK)	Bright incandescent natural/infrared light value/natural and infrared brightness ratio
22~24	LED/Dim/Inacn pre Cal Error [BLACK]	Pre-correction error of fluorescent lamp/dim incandescent lamp/bright incandescent lamp
25~27	First Eqn a/b/c (BLACK)	Use the formula a/b/r to calculate the value at which the photoreceptor reaches equilibrium for the first time.
28~30	Sencond Eqn a/b/r (BLACK)	Use the formula a/b/r to calculate the value at which the photoreceptor reaches equilibrium for the second time.
31~33	Single A/B (BLACK)/Ratio A/B (BLACK)	Select the value of the photoreceptor at the A/B point/the ratio of A to B
34~35	Ch0 LED (WHITE)/Ch1 LED (WHITE)	Fluorescent natural light brightness/fluorescent infrared brightness
36~37	Ch1/Ch0 LED (W)/Lux/Ch0 LED (WHITE)	Brightness ratio of fluorescent light to infrared light/brightness ratio of fluorescent light to natural light
38~40	Ch0/1 Dim (W)/Ch1/Ch0 Dim(WHITE)	Dim incandescent natural infrared value/ratio of natural light to infrared brightness
41~43	Ch0/1 Incan (W)/Ch1/Ch0 Incan (WHITE)	Bright incandescent natural/infrared value/ratio of natural light to infrared brightness
44~46	LED/Dim/Incan Pre Cal Error (WHITE)	Pre-correction error of fluorescent lamp/dim incandescent lamp/bright incandescent lamp
47~49	First Eqn a/b/r (WHITE)	Use the formula a/b/r to calculate the value at which the photoreceptor reaches equilibrium for the first time.
50~52	Sencond Eqn a/b/r (WHITE)	Use the formula a/b/r to calculate the value at which the photoreceptor reaches equilibrium for the second time.

53~55	Single A/B (WHITE)/ Ratio A/B (WHITE)	Select the value of the photoreceptor at the A/B point/the ratio of A to B
56~57	Update Device Parameters/Fixture SN	Update device parameters/read SN of test device
58	Position/ Skunk Status Check	Get the position of the machine/check the test items

5. ALS TestÿAmbient Light Sensor Testÿ

Three different light sources (fluorescent lamps, bright lamps respectively) mounted on the cross bracket are controlled by motors.

(incandescent lamp, dim incandescent lamp) rotates so that it illuminates the ALS chip on the machine under test in turn.

Verify the accuracy of the ALS chip calibration through the light received by the chip and its calculation value. Test station hardware

The parts are basically the same as the ALS calibration station. During the test process, different light sources are used in a certain order and

The ALS photosensitive module on the UUT is irradiated once, so that the ALS chip receives different light intensity signals and then processes the data.

Perform processing to determine whether the processed value meets the requirements.

Main Test Item Of ALS Test Station		
No.	Main Test Item	Description
1~3	SN/ Start Skunk/ DutDeviceName	Read the machine SN/Start communicating with PDCA/Read the device name
4~5	PreTestRunner/ CheckForUnitConfig	Check the fixture/check the machine configuration before testing
6~8 ALCRunner/Data Blob/Dut Conn Status Start testing/test data storage location/whether the machine is tested at the same time		
9~11	Lux LED/Lux Dim/Lux Incan	Brightness of fluorescent lamp/dim incandescent lamp/bright incandescent lamp
12~14 Ch0/1 LED (BLACK)/Ch1/Ch0 LED (B) Fluorescent lamp natural/infrared brightness/ratio of natural and infrared brightness		
15~16 Lux/Ch0 LED (BLACK)/Ch0 Dim (BLACK) Brightness ratio of fluorescent lamp to natural light/dim incandescent lamp to natural light value		
17~18	Ch1 Dim (BLACK)/Ch1/Ch0 Dim (B) Dark incandescent lamp infrared value/dark incandescent lamp natural and infrared brightness ratio	
19~21 Ch0/1 Incan (BLACK)/Ch1/Ch0 Incan (B) Bright incandescent lamp natural/infrared light value/natural and infrared brightness ratio		
22~23 Ch0 LED (WHITE)/Ch1 LED (WHITE)		Natural light/infrared brightness of fluorescent lamps
24~25 Ch1/Ch0 LED (W)/Lux/Ch0 LED (WHITE) Fluorescent lamp natural and infrared brightness ratio/fluorescent brightness and natural light brightness ratio		
26~28 Ch0/1 Dim (W)/Ch1/Ch0 Dim (WHITE) Dark incandescent lamp natural/infrared light value/dark incandescent lamp natural and infrared brightness ratio		
29~30 CH0 Incan (WHITE)/Ch1 Incan (WHITE) Value of natural light from bright incandescent lamp/value of infrared light from bright incandescent lamp		
31~32 Ch1/Ch0 Incan/Update device parameters Brightness ratio of natural incandescent lamp to infrared/Update device parameters		
33~35 Double Eq Lux Error (LED/Dim/Incan) Luminance error between two balance points of fluorescent lamp/dim incandescent lamp/bright incandescent lamp		
36~38 Double Eq ALS Lux (LED/Dim/Incan)[LUX] The sensitivity error of the two balance points of the photoreceptor from three light sources		
39~41 Fixture SN/Position/Skunk Status Check		Read fixture SN/read machine position/check test items
42~43	Write to PDCA/Close Skunk	Upload Log to PDCA/Close the communication between the test fixture and PDCA

6. Hall Effect TestÿHALL **Sensor Effect Testÿ**

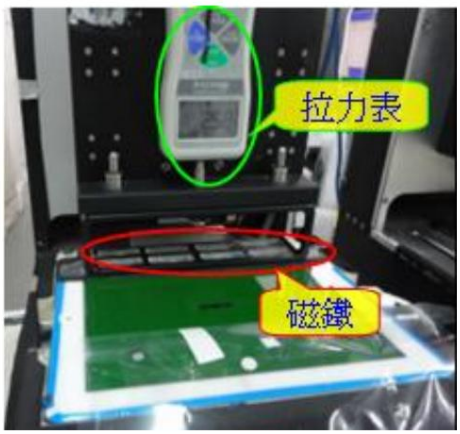
Main Test Item and Discription Of Hall Effect Sensor Station		
No.	Test Item	Discription
1~3	Enter Diag [:-)]/SN/Fixture Init	機台進入DIAGS模式/讀取機台SN號/治具初始化
4~5	Read Fixture SN/Move motor to 20.0mm	讀治具SN號/控制治具磁鐵移至距機台20mm處
6	NetWork CB: Check Previous Station CBs	檢查前序工站測試控制位
7~8	Find trigger distance [0x0]/Edge Sensor Trigger Disatance	尋找霍爾芯片觸發距離/檢測邊緣霍爾芯片觸發距離
9~10	Center Sensor Trigger Disatance/Edge Hysteresis Disatance	檢測中心霍爾芯片觸發距離 /檢測邊緣霍爾芯片磁滯
11~12	Find release distance [0x1]/Edge Sensor Release Disatance	尋找霍爾芯片釋放距離/檢測邊緣霍爾芯片的釋放距離
13~14	Center Sensor Release Disatance/ Hysteresis Disatance	中心霍爾芯片的釋放距離/中心霍爾芯片的磁滯
15~17	Return motor to 20.0mm/Write HEFFSensor CB /Write PDCA	治具移動至距機台20mm處/寫控制位/上傳PDCA系統

During the test, use an external magnet to approach or leave the location of the UUT Hall chip, so that the Hall

The Sensor generates a trigger or release, and compares the trigger or release distance with the standard sensing distance value range.

Compare it to see if it is within the expected range, so as to determine whether the function of the Hall chip meets the requirements.

7. Magnet Spine& Flap



Mainly test whether the magnetic force of strong magnet and weak magnet matches

Meet the standards. During the test, the fixture uses air pressure to adsorb the UUT on the

on the bracket, and then use the magnet with the tension gauge to move closer and further away from the machine.

platform, during this process the tested tensile force combined with the software can

To calculate whether the magnetic force of the machine's strong magnet and weak magnet meets the requirements.

Main Test Item and Discription Of Magnet Spine Station		
No.	Test Item	Description
1~2	SN/Net Work CB: Check Previous Station CBs Read the SN of the machine/check the control bit status of the previous station	
3~4	Net Work CB: Check Fatal Error/Fixture Reset Check whether the machine test path is correct/fixture reset	
5~7	Fixture Start/Moter Down/Gauge Meter Reset to Zero Fixture Start/Moter Down/Gauge Meter Reset to Zero	
8~10	Moter Up/Fixture Status/Get Spin Max Value Fixture magnet moves up/Fixture Status/Get Spin Max Value	
11~13	Fixture Reset/Write Magnetic Spin CB/Write PDCA Fixture reset/Write magnetic station control bit/Upload PDCA	
Main Test Item and Discription Of Magnet Flap Station		
No.	Test Item	Description
1~2	SN/Net Work CB: Check Previous Station CBs Read the SN of the machine/check the control bit status of the previous station	
3~4	Net Work CB: Check Fatal Error/USB Peresent Check whether the machine test path is correct/USB presence detection	

5~7	Fixture reset/Fixture Start/Moter Down	Fixture reset/fixture starts testing/fixture magnet moves down
8~10	Gauge Meter Reset to Zero/Moter Up/Fixture Status	Gauge meter reading reset/fixture magnet moves up/fixture status

Main Test Item and Discription Of QT3		
No.	Main Test Item	Description
1~2	Read Back Temperature [15,30] / Humidity [35,60]	Read the temperature/humidity of the environment where the test equipment is located
3~4	EnterDiag [:-)] / Check Battery Level Before Test	The machine under test enters DIAGS mode/reads the power of the machine under test
5~7	Get Board ID / SN / Check Previous Station CBs	Read the motherboard ID number / SN number / check the station control bit

11~12	Get Cover Max Value[1,6]/Fixture Reset 2	Get the maximum test value of weak magnetic field/reset the test fixture
13~14	Write Magnetic Rentention Cover CB/Write PDCA	Write magnetic weak station test control bit/upload PDCA

8. QT3ÿProximity Calibrationÿ

When an obstacle approaches the proximity sensor, capacitance is formed. With obstacles and approaches

Depending on the distance between the sensors, the dielectric constant of the capacitor changes accordingly. The proximity sensor chip switches this

The capacitance value is quantified and converted into digital form, read out through instructions and compared with the standard value, such as

If the read data is within the standard value range, then PASS, the test fixture consists of four parts, divided into

When the obstacle is simulated to be 0 degrees, 90 degrees, or 180 degrees from the UUT, the machine proximity sensor responds to the obstacle signal.

Information sensing capabilities and signal processing capabilities.

8~10 Check Fatal Error/Diag Version/Prox Reset [:-)] Check test path/enter Diags mode/Prox chip initialization		
11~16 Read Register 0x00/0x45/0x8A/0x81/0xC2/ 0xD2 Read the data in register 0X00/45/8A/81/C2/D2		
17~18 Free-Space Baseline/Base Prox Value [45K,50K] The machine is in free space/read the free space test value		
19~20 Base Centerpoint Value/Temp Value [32K,50K]		Select test center point value/read center temperature value
21~22 Base AdjProx Value/Angle:90 degree Distance:14 Calculate Prox calibration value/obstacle is 14mm.90° from the machine 28~29 PS6&PS7		
90 Delta Value / 90 SD Value [0,25] Obstacle and machine 90 Sensing value/interference value at °		
30~31 Angle:0 degree Distance:14(mm) / 0 Delta Value The obstacle is 14mm from the machine, 0°/read the sensing value		
32~33 0 SD Value/ Angle:180 degree Distance:14(mm) Read interference value/obstacle is 14mm from the machine, 180° 34~35 PS6&PS7 180		
Delta Value /180 SD Value [0,25] Obstacle and Induction value/interference value when the machine is 180°		
36~37 Write Syscfg Key CPCL/Check Battery Level Write and check configuration information/read battery after test		
38~39	Write QT3 CB [OK] / Write PDCA	Write station control bit/upload to PDCA system

9. QT4ÿProximity Susceptibilityÿ

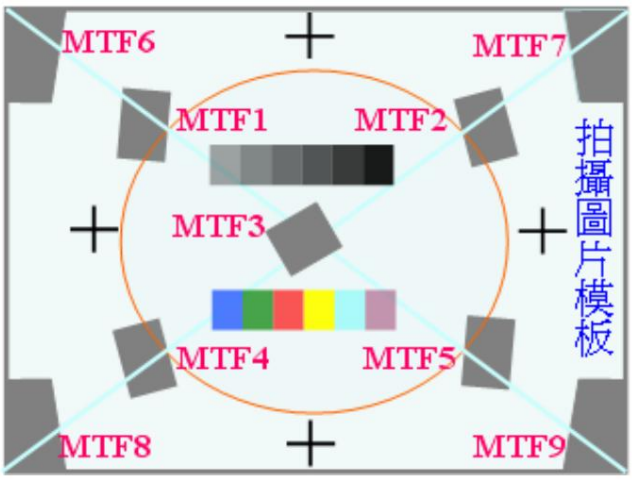
Proximity sensor sensitivity test. Mainly test WF4 (proximity sensor antenna)

Whether the ability to adjust radio frequency communication signals meets standards. The main function of the proximity sensor is to adjust the 3G

The module transmits power to reduce the damage of mobile communication radio frequency signals to the human body.

The proximity sensor transmits the signal to 3G through identification, reducing the transmission power.

Increase the transmission power of the machine.



3.5. IPAD dual camera test

Dual Camera

The IPAD middle and rear cameras use automatic alignment

Focus camera, each pixel consists of three photosensitive

The unit senses three colors of R/G/B respectively.

response, and convert it into an electrical signal, which is converted into a digital image through the microprocessor chip for related operations.

prime value. The test station obtains the result by performing relevant analysis and processing on the pixel value. All tests are

Based on the obtained digital pictures. There is a standard template (Chart) in the upper and lower parts of the test station.

Main Test Item Of Dual Camera Station

No.	Test Items	Test Item Description 1~3 yavg/
30mtf_xtilt/ 30mtf_ytilt Evaluate the imaging effect through the average brightness/test the X, Y axis offset through four positioning crosses		
4~5 30mtf_totaltilt/ 30mtf_rotation Detect the total offset of the image to be tested through the cross/detect the front camera Whether abnormal		
rotation occurs 6~10 30mtf0/ 30mtf_mtf30f1~f4 Detect the camera through the adjacent gray and white bevel edges at positions 1~5 of the		
30cm chart. 11~18 30mtf_mtf60f1~f4/ 85f1~f4 Detect the camera through the adjacent gray and white bevel edges. Definition at 30cm chart positions 6~13		
19~20 30mtf_mtf30tilt/ mtf60tilt		The ratio of the 30% & 60% area edge MTF test value to the center area value is the imaging uniformity
21~22 30mtf_dfov/Blemish_ymin Detect the viewing width (angle of view) of the camera/shoot the area with the smallest brightness of the white drawing board		
23~24 Blemish_ymax/Blemish_yavg Shoot the area with the smallest brightness of the white drawing board/find the average brightness to determine the imaging effect of the image to be analyzed		
25~26 Blemish_shading/ totalcount Vignetting test detects the difference in brightness around and in the middle of the captured image/calculates the number of dirty		
spots in the image 27~28 maxVFPN_b/ maxVFPN_g2 Tests in total darkness whether there are bright lines during the shooting process of the rear camera		
29~30 maxVFPN_g1 / maxVFPN_r Tests in total darkness whether there are bright lines when taking photos with the rear camera 31~33 max_ru_center/		
edge/ corner Relatively uniform test, detects the consistency of image imaging, and tests the difference value of adjacent areas of the image		
34~35 MaxRateCol_Y/ Row_Y		Test whether there are bright lines when taking photos with the rear camera under light conditions
36~37 MaxRateCol_cb/ Row_cb		Test whether there are bright lines when taking pictures with the rear camera when there is
38~39 MaxRateCol_cr/ Row_cr		light. Test whether there are bright lines when taking pictures by the rear camera when there is light.
1~3	yavg/60mtf_xtilt/60mtf_ytilt Evaluate the image imaging effect through the brightness average/test the X, Y axis offset 4~5 through the positioning cross	
60mtf_totaltilt/60mtf_rotation Detect the total image offset through the positioning cross/detect whether the front camera rotates abnormally		
6~14	60mtf_mtf1~60mtf_mtf9 The camera's resolution at positions 1~9 of the 30cm chart after detection through the adjacent gray-white bevel edge is 15~16	
60mtf_mtfTilt60/mtfTilt90 The comparison of the MTF test value in the 60% & 90% area and the test value in the center area is the imaging uniformity 17~19		
60mtf_dfov/ 10mtf_xtilt/ ytilt Rear camera angle test/Test X, Y axis offset through four positioning crosses 20~21 10mtf_totaltilt/10mtf_rotation Detect the		
total image offset through positioning cross/Detect whether the rear camera rotates abnormally 22 ~30 10mtf_mtf1~10mtf_mtf9 The sharpness of the camera at		
positions 1~9 of the 30cm chart after passing the adjacent gray and white bevel edge detection 31~32 10mtf_mtfTilt60/mtfTilt90 60% &90% area MTF test value and		
the center area test value are compared to the imaging uniformity 33~35 totalcount/center/outercount total number of dirty spots/number of dirty spots in the center		
area/number of dirty spots in the peripheral area 36~38 maxsize/maxsizecenter&outer maximum size of stains/size of dirty spots in the central area/size of		
dirty spots in the outer area		
39~41 max_ru_center/ edge/ corner Relative uniformity test, detects the consistency of image imaging, and tests the difference value of adjacent areas of the image		

The front and rear cameras take pictures of the upper and lower templates respectively. During the test, the lower panels are adjusted separately under the control of the cylinder.

Adjust the camera to a distance of 10cm and 60cm from the lens, and the rear camera will take pictures of them sequentially through autofocus, and the front camera will

The panel is 30cm away from the front camera. The front camera takes a picture of it, and then analyzes and evaluates the function of the camera.

Whether it is good or not. The front and rear camera tests mainly include the following content: Calculating the camera through the modulation transfer function

resolution, measure whether the camera is deflected, whether the imaging is offset, whether there is dirt, and whether the camera views

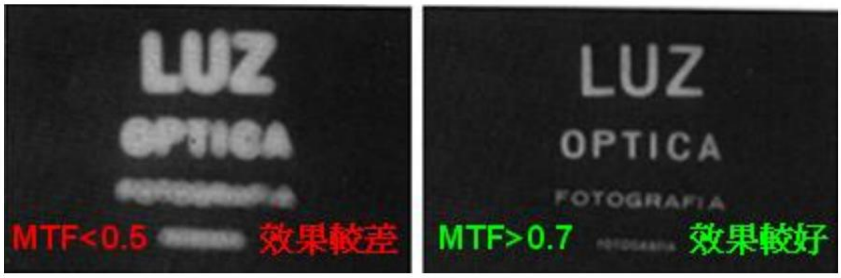
Whether the angle meets the standards, etc. The test parameters will be introduced below.

1ÿ MTF (Modulation Transfer Function)

The modulation transfer function is mainly used to evaluate the clarity of camera photography. Its testing and calculation method

The formula is as follows:

(1). Check the test template



MTF test module for

Take a photo (the midpoint of the gray-white boundary line) and generate a picture.

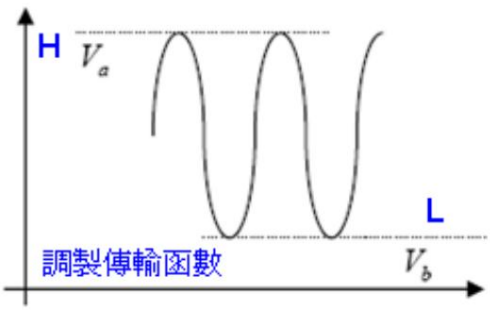
(2). Sampling the gray and white junction on the left side of each MTF, the sampling area size is 60*60 Piexls.

(3). By scanning, sequentially read the pixel values of columns from the white area to the gray area, and get something like

Graphic of sine wave.

(4). Perform FFT operation on the graph to obtain the changing relationship in the frequency domain. You can judge its changes by

The relationship between the black and white interface and the frequency can be used to determine the changes at the junction of black and white. The sharper the resulting sine waveform, the



It means the picture is clearer.

(5). After obtaining the test picture, you can also calculate the

Calculate and compare to find the maximum pixel value in each sampling area

Maximum and minimum values Max and Min.

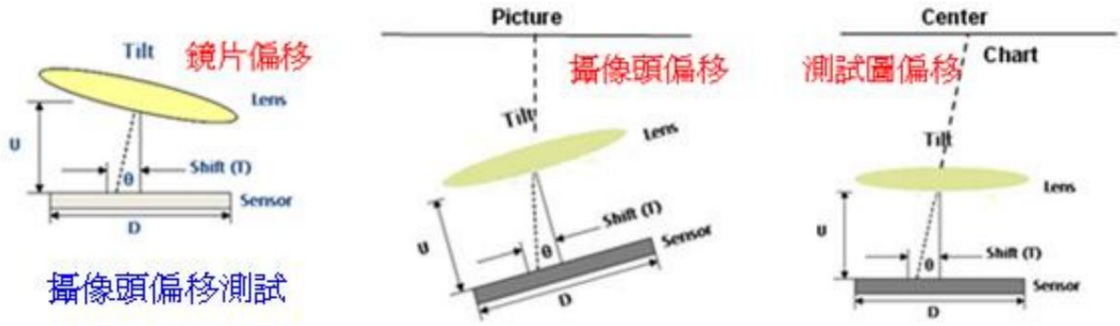
(6). Find the average to get the average pixel average of each area. Average = (Max + Min) / 2.

(7). Based on the average Average, search for the brightest and darkest pixel values in each sampling area.

and marked "H" and "L". (8).MTF = (H - L) / H * 100%.

2. Tilt (offset test)

The Tilt test is used to test camera position testing, including lens offset and camera offset.



(1). Sample four cross modules and find their center points.

(2). Find the center point (Xa, Ya) corresponding to the picture by averaging the (X, Y) values of the four points.

(3). Perform geometric operations on the standard center point Center (Xc, Yc) and the center point of the picture to find the corresponding Tilt

ÿÿ= tan (ÿ((Xa-Xc)

²+(Ya-Yc)²)* (pixel size)/

Effective Focal Length)ÿ

(Pixel size is the camera

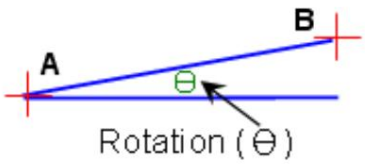
The unit length or width of each pixel, Effective Focal Length is the camera has Pixel size is

The unit length or width of each pixel of the camera).

(4) As can be seen from the formula, the horizontal position of the picture (as far as Chart is concerned) will also affect Tilt.

Test value, this is also the principle of Chart level verification.

3. Rotation (rotation test)



The Rotation test is used to test the horizontal deflection of the camera.

(1). Take a photo of the Chart, calculate the 4 cross center positions, and mark them in pixel units.

(2). Extract any two points A (X1, Y1), B (X2, Y2).

(3). The inclination is ÿ, then tanÿ= (y2-y1)/(x2-x1).

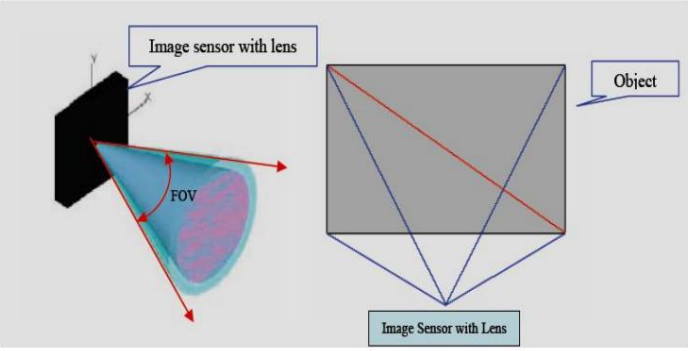
(4).Then the inclination Rotation ÿ= tan⁻¹ÿÿ(y2-y1)/(x2-x1)ÿ.

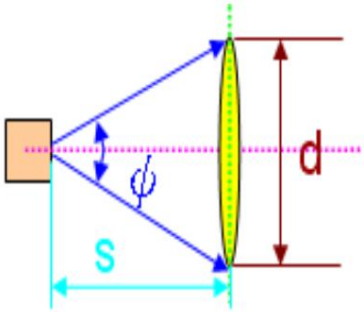
(5). The Spec of Rotation is -2deg< ÿ< 2deg.

4. FOV (Filed **of** View) (viewing angle test)

The angle of view test is used to calculate the incident range and angle of the camera's light to the object.

(1). Calculate the size of the picture by comparing the size of the pixel values.





(2). By bringing in the lens phase formula, the size of the corresponding Chart area can be obtained.

(3). As shown in the figure above, FOV(ÿ)=2* tan⁻¹(dÏ2/S).

5. Blemish (dirty test)

The Blemish test will comprehensively check whether the camera is corrupted, whether there are dead pixels in the sensor, etc.

(1) Control the test tool through the test software and let the camera take pictures of the Blemish board.

(2). Define the pixel value range from black pixels to white pixels as: 0~255. Compare the larger of each pixel value

Small, perform the following calculations in sequence.

(3). Ymin, the minimum non-white pixel value in the vertical direction. (Spec: 0~255)

(4). Ymax, the maximum non-white pixel value in the vertical direction. (Spec: 0~255)

(5).Yavg, the average pixel value of dirty or dead pixels in the vertical direction. Prevent the dirty area from being too large (50~200).

(6).Blemish The number of dirty or dead pixels (non-white pixels): (Spec:0~2)

6. Shading (Vignetting test)

Shading test is used to check the camera during assembly process

, whether any Sensor area is covered or damaged, and pictures

Whether there are black corners, etc. during the test, the center area of the camera is used as the

Standard area.

(1). Take photos of the Blemish board and analyze the resulting pictures.

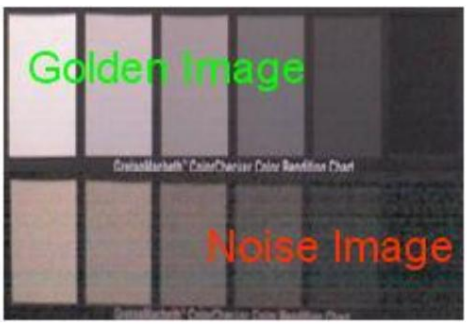
(2). Take more than 50 sampling areas at the edge of the picture, and calculate the minimum value (i.e. the darkest area

domain).

(3). Calculate the pixel value Center of the center area.

ÿ4ÿ.Shading= Corner Min /Center * 100% ÿ (Specÿ0.4~1)

7. SNR (Signal Noise Rate) signal-to-noise ratio test



Test camera pixel acquisition and processing process

, anti-interference ability to noise signals.

(1). Grab the middle of the 6 levels of grayscale stripes in the Chart.

center area and read its pixel value (RGB).

(2). Convert pixel values to Yuv values, the formula is:

Y = R*ÿ0.299ÿ+G*ÿ0.587ÿ+ B*ÿ0.114ÿ

U = R*ÿ-0.169)ÿ+G*ÿ-0.332ÿ+ B*ÿ0.500ÿ+128

V = R*ÿ0.500ÿ+G*ÿ-0.419ÿ+ B*ÿ-0.0813ÿ+128

Among them, u and v are only chromaticity values. For black and white systems, their values are the same.

(3). Average the Y values of the 6 areas and calculate their SNR: $SNR\ dB = 20\log_{10}\frac{Average}{noise}$

8. Color (color test)

1. Capture each color stripe in the Chart

Center area (shown in Figure 4_1), press

RGB records the pixel value of each point.

2. Compare the Spec of each color to determine the camera's ability to reflect color.

3.6. Display and touch screen test

1.Grape Offset Test

After laminating the whole machine in the clean room, test whether normal data can be completed between Grape and MLB.

According to transmission, the Grape ground pin is normal. Determine whether the touch screen is damaged during the lamination process in the clean room.

cause damage. The test project includes Data Collection,

Offset Test, Ground Shield Test three items.

2. Grape Pre-Calÿ Grape Pre-Calibrationÿ

First, send instructions through the fixture to test the touch screen.

Basic performance such as grounding, data transmission performance, delay, etc. In the later stage of the test, the fixture is under air pressure control

Move downward, and the six contacts on the fixture exert a certain pressure on the Grape to test whether the Grape can

Understand a certain amount of pressure. After the test, the cylinder control fixture is reset.

3. Grape Calÿ Grape Calibrationÿ

觸摸屏相關測試項目解析	
Data Collection	獲取觸摸屏及機台序列號
Offset Test	測試觸摸屏及MLB之間數據傳輸是否完全
Phase Test	測試感應線對驅動線發出的信號的接收速度
Gross CFB Test	電容反饋值測試，校準觸摸屏個點電容值
Fine CFB Test	不同頻率對每個像素電容進行補償并獲取校準數據
Save Collection	存儲Log信息和電容補償數據
Gnd Shield Test	驗證接地對電子線路及觸摸屏測試的影響
Check Critical Error	檢測觸摸屏和主板之間通信是否正常
Calibration Check	檢查存儲的Log值及電容補償數據
Grape Digital Open	測試感應線線某一端是否存在開路
Digi Open Test Panel	測試觸摸屏個點電容回饋值是否正常

After starting the test, the touch screen chip obtains the capacitance value of each point of a set of arrays on the touch screen through scanning.

The calibration fixture analyzes the acquired data to determine whether the reference capacitance at each point of the touch screen reaches the predetermined value.

Determined strength and uniformity. When the fixture is pressed down under air pressure control, the conductive rubber triggers the touch screen, and the

to a set of capacitance values at each point (during this process, the pressure of the conductive rubber on the touch screen must be kept uniform everywhere.

uniform), and finally the correction fixture calculates a set of compensation parameter values based on the obtained data, and stores them

into the UUT as the compensation standard value of the touch system after the UUT restarts. At the grape test station, the

Test critical parameters to verify whether the correction value is the most appropriate. The following will introduce Grape related test work

The main items of website testing are introduced.

4. LCD UniformityÿLiquid Crystal Display Uniformityÿ

Test LCD uniformity. During the test, the machine enters Diags mode and keeps LCD testing.

The screen is evenly lit, and the camera captures the screen and calculates the brightness value of each part (unit:

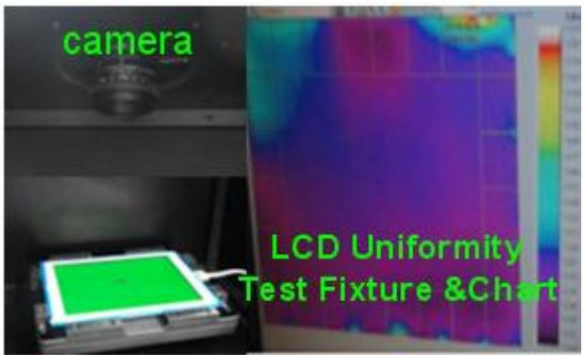
candela/square meter) to determine whether each part of the LCD is uniform. The brightness value analyzed by the fixture will not be used

Marked with the same color, the more uniform the color tone is, the better the uniformity of the LCD is. LCR refers to

Light leakage occurs in a small area among the 24 areas distributed around; VTH refers to the LCD edge 24

A large area of light leakage in a certain area.

5. MMIÿMan **Machine Interfaceÿ**



Human-machine interface test, simulating the normal application of the machine

use. The test machine is manually powered on and enters the test mode.

mode, observe the machine by manually touching the test icon

Whether each functional module can work normally (for example, whether SPK and HP can switch and play the stored content normally)

audio files stored in the memory, whether there is any abnormality in the LCD display, and whether the machine can function normally after plugging in the power cord.

Charging normally, can the B81 fixture be adsorbed on the magnet of the machine, and can the front and rear cameras work normally?

photography, etc.).

3.7. IPAD radio frequency test knowledge

1.PATÿPassive Antenna Testÿ

Passive testing mainly focuses on evaluating the antenna and conductor from the gain, efficiency, and pattern of the antenna.

Transmission loss (Voltage Standing Wave Ratio) and antenna radiation performance.

(1) Reflection loss: When the feed line and antenna are matched, there is no reflected wave on the feed line, only the incident wave.

That is, the only wave transmitted on the feeder is the wave traveling toward the antenna.

The current amplitudes are equal. The impedance of any point on the feed line is equal to its characteristic impedance.

When the feed line is not matched, that is, when the antenna impedance is not equal to the characteristic impedance of the feed line, the load can only absorb the feed line.

Some of the high-frequency energy transmitted on the line cannot be absorbed completely, and the unabsorbed energy will be reflected

Go back and form a reflected wave.

(2) Voltage standing wave ratio: In the case of mismatch, there are incident waves and reflected waves on the feeder at the same time.

Where the incident wave and the reflected wave are in phase, the voltage amplitudes add up to the maximum voltage amplitude Vmax.

The voltage amplitudes at the places where the incident wave and the reflected wave are in opposite phases are subtracted to form the minimum voltage amplitude.

The amplitude Vmin of other points is between the antinode and the node.

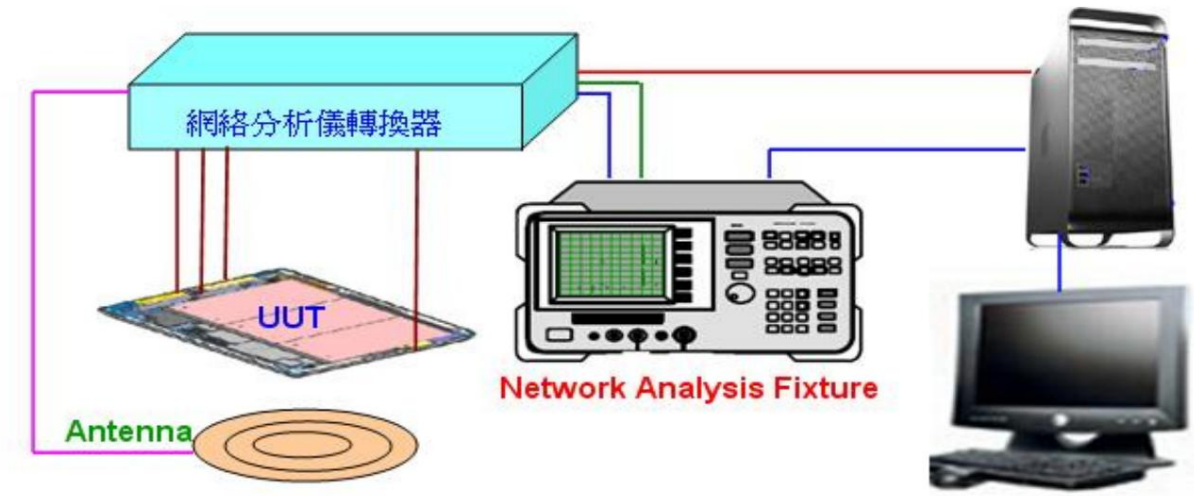
The wave is called a traveling standing wave. The ratio of the reflected wave voltage to the incident wave voltage amplitude is called the reflection coefficient, and the antinode voltage

The ratio of the voltage amplitude to the node voltage is called the standing wave coefficient, also called the voltage standing wave ratio. Terminal load impedance and characteristics

The closer the impedance is, the smaller the reflection coefficient is, the closer the standing wave ratio VSWR is to 1, and the better the match is.

(3) Gain: Under the same input power, the radiation power of the antenna at a certain point in space is the same as the ideal non-directional

The ratio of the power of a point source antenna at the same point.



(4) Efficiency: the ratio of antenna radiation power to antenna input power.

(5) Directional diagram: At a certain distance from the antenna, the relative field strength (normalized mode value) of the radiation field changes with the direction.

The changing pattern is often represented by two mutually perpendicular planes in the maximum radiation direction of the antenna.

(Its sharpness describes the power flow density in the maximum radiation direction in the same direction as the ideal non-directional antenna.

ratio of power flow density over distance).

During the test, the signal from the network analyzer is transmitted to the horn antenna through the cable, and then radiated

The signal is emitted to the UUT antenna. After receiving it, the UUT antenna feeds the received signal to the network branch through the cable.

analyzer, the network analyzer then calculates the corresponding parameter values through calculation processing, and compares the parameter values

Whether it is within the standard value range determines whether the performance of the antenna in radiating electromagnetic waves is good.

2. Diversity GPS

By touching the antenna on the motherboard

Point resistance test to determine the motherboard and

Is it possible to transmit between the antennas?

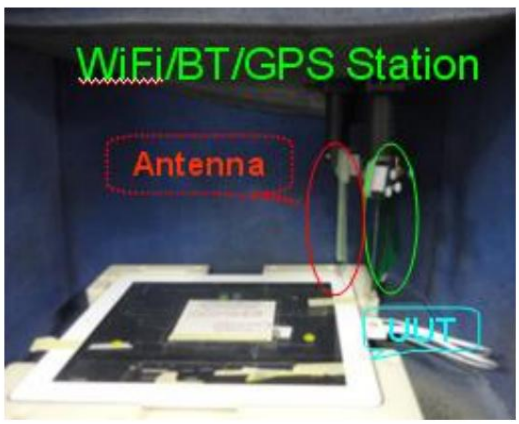
pathways that conduct signals. During the test, remove the insulating material from the relevant contacts on the motherboard and manually press

Press the test button, the probe will automatically fall under the pressure of air, and the resistance will be measured by touching the contacts on the motherboard.

Determine whether the antenna path is normal based on the resistance value range. In IPAD3, this station mainly tests

Are WF2, WF3, and WF5 connected to the motherboard normally?

3.WIFI/BT/GPS OTAÿOver the Airÿ



OTA testing requires the use of a test box. The test box

On the one hand, it isolates external electromagnetic signals to prevent them from affecting the test

causing interference; on the other hand, the test box is inlaid with bubbles

Cotton is used to absorb the test signal in the test box and prevent it from being reflected inside the test box and causing dryness.

interference signal, affecting the test. This workstation was tested in WiPAS mode. When testing the machine performance, the comprehensive test

The tester is the master device and the machine is the slave device. The comprehensive tester sends control commands through the radio frequency channel.

to the UUT. After the UUT is decoded, the test mode is activated. The tester sends the LPM command to activate the UUT to enter.

Test mode and configure some parameters of the link between the tester and the UUT. Such as test method,

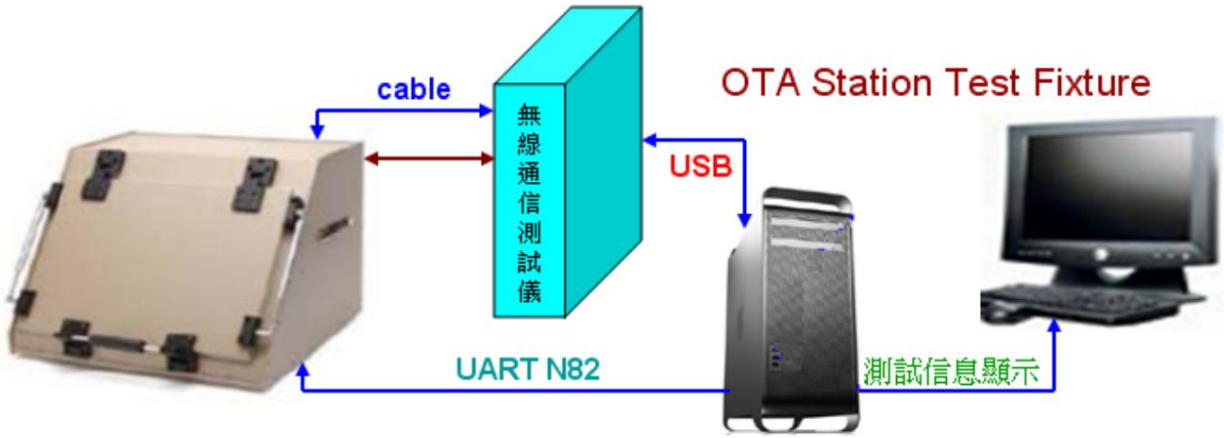
Whether frequency hopping is a single time slot or multiple time slots, etc. The tester measures the entire burst range at three frequency points: low, medium and high.

Measure peak power and average power within the range. The TX test is mainly for ADC, APC (Automatic

Power Control), temperature compensation, baseband operation, radio frequency response correction, RX mainly for AFC

(Automatic Frequency Control), power amplifier performance, intermediate frequency transmission and reception performance are tested

try. Common concepts in testing will be explained accordingly below.



(1) Quadrature modulation (I/Q): modulates communication signals through hardware devices. Route I is 0 degrees and 180 degrees,

Road Q is 90 degrees and 270 degrees. The two signals are orthogonal. Through serial-to-parallel conversion, each channel modulates half of the information.

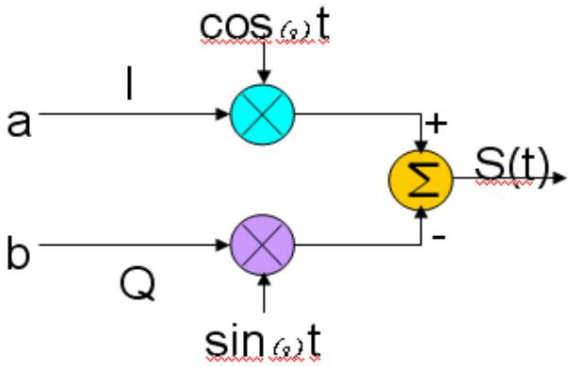
Through parallel transmission, doubling the transmission rate can achieve 2 times the bandwidth. Another one for quadrature modulation

The function is to reduce interference.

Theoretically, the amplitude signal and phase

Signals can be modulated simultaneously or separately, but are difficult to detect

measurement, so in practical systems, the signals are divided into two groups



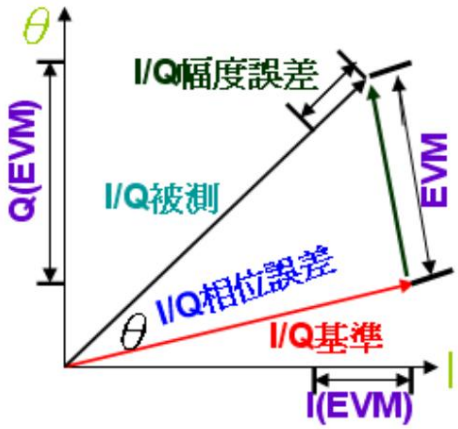
Isolate components. I (in the same direction) and Q (orthogonal), the two sets of components are orthogonal to each other and do not interfere with each other. I, Q two

The input signals are a and b respectively. Modulate with cosÿt and sinÿt standard signals respectively and add them together to get

Modulated signal S(t), as shown in the upper left figure.

(2), Error vector magnitude (EVM): 802.11a/b/g

The annotation uses EVM to describe the total modulation precision of the transmitter.



Spend. and gives a direct sequence of how to measure 802.11b/g

Column spread spectrum signals and 802.11 a/g OFDM signals

EVM approach. The standard passes all data subcarriers that make up the signal and all the data that make up the frame.

OFDM symbols (at least 16 symbols per frame), and then use the average of the signal constellation points

The power is normalized and averaged over at least 20 frames to define EVM. This way you can be sure

Define the unique EVM value for 802.11a/b/g. Low-speed direct spread spectrum sequence calculation based on peak value, high-speed calculation

Multi-carrier and multi-symbol averaging.

The error vector magnitude is defined as the difference between the actual modulated transmitted signal and the ideal

The vector difference between error reference signals.

In 802.11a/b/g, the WLAN baseband processor modulates the signal, either on-chip or on-chip.

After external D/A conversion, a combined I and Q analog output signal is provided directly from the subsequent RF section.

frequency conversion, the WLAN baseband processor is usually not the source of transmission signal impairment, the impairment is mainly

This is caused by analog changes in the signal path through PCB equipment and RF circuitry. Component changes, PCB

Printed circuit layout defects, instability of crystal oscillators and frequency synthesizers, distortion and registers of power amplifiers

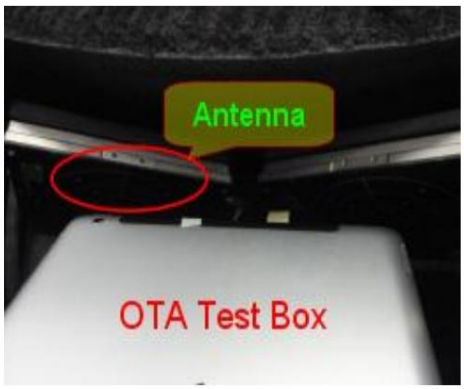
The presence of raw signals will deteriorate the transmitted signal.

(3) Receive Sensitivity: the bit error rate or frame error rate does not exceed a certain specified value

minimum received power. It is the most important factor required to characterize the receiver's ability to correctly receive and demodulate signals.

Low power. The better the receiver sensitivity, it means that the power emitted by the base station can be as small as possible.

For code division multiple access systems, it means larger system capacity.



4.Red-Single OTAÿRed **Single Over The Airÿ**

The workstation is tested in WIPAS mode. During the test

There is no need to insert a SIM card or set up a call. Measured to weigh more than

Test UUT signal modulation quality and various interferences and losses during signal transmission. During the test,

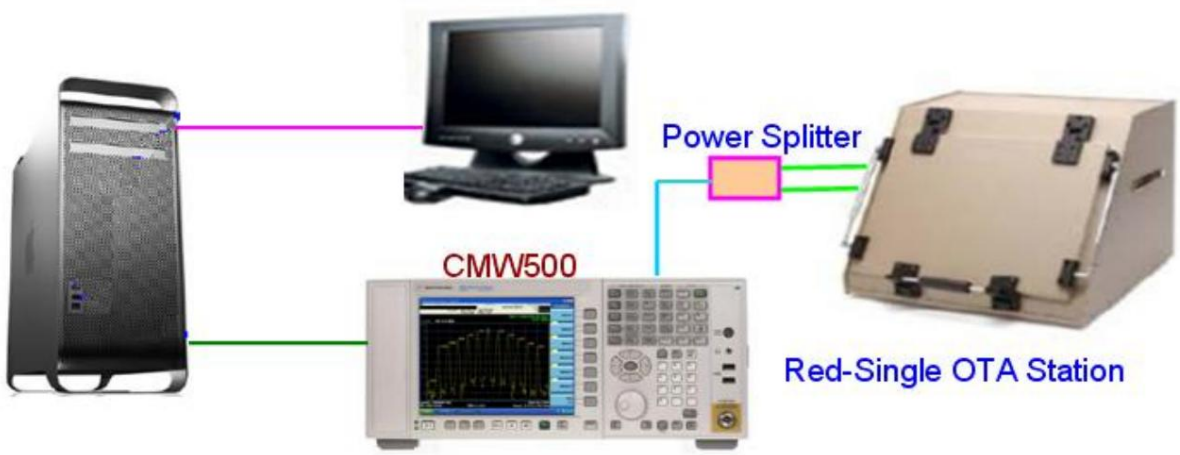
The PC controls the UUT to transmit the communication signal, and the test equipment antenna receives it and processes the corresponding data.

Then calculate the error vector amplitude, carrier peak power, carrier frequency envelope, modulation spectrum, switching spectrum, frequency

The transmitter performance can be evaluated by frequency error, phase error, conducted spurious interference, transmitted peak current and average current.

Yes, the receiving part is evaluated by receiving sensitivity, receiving signal indication level, and receiving signal indication quality

Receiver performance.



(1) Frequency Error: The GSM modulation scheme is Gaussian minimum frequency shift keying

ÿGSMKÿ, normalized bandwidth BT=0.3, testing the frequency and phase error of the transmitted signal is to verify the signal transmission

The quality of the modulated signal.

The frequency error is defined as the difference between the frequency of the transmitted signal and the absolute value after considering the effects of modulation and phase error.

For the difference between the nominal frequencies corresponding to the RF channel signals, he can perform linear regression through the phase error.

The frequency error can be obtained by calculating the slope of the regression line. The smaller the frequency error, the faster the frequency synthesizer can switch.

The signal generated by the base station is stable enough. Only when the signal frequency is stable enough can the mobile phone communicate with the base station.

Stations stay in sync

(2) Phase Error: The phase of the signal transmitted by the transmitter is equal to the theoretical best signal.

The theoretical phase trajectory can be obtained by using a known pseudo-random bit stream

The phase trajectory can be viewed as the phase compared with the carrier phase.

Change curve, continuous 1 will cause continuous 90 degree phase decrease, continuous 0 will cause continuous

90 degree phase increments. The phase error can be used to see whether the modulator is working properly. The power amplifier

Whether distortion occurs and the magnitude of phase error indicate the performance of the I, Q DAC and Gaussian filter.

The quality of the modulated signal of the transmitter must maintain a certain index in order to be able to

Maintain a low bit error rate on the wireless link when there is interference.

(3) Received signal strength indication (RSSI): In order to ensure communication quality and handover, dynamic frequency

rate selection or system power control, the base station generally requires the mobile station to report the received signal strength to

Make the system make the right choices and decisions. Therefore, whether the signal strength received by the mobile station is accurate,

Directly determines the performance of the entire communication system. Generally speaking, Received Signal Strength Index calibration is divided into accuracy

Calibration and error calibration. Accuracy calibration is through AGC (Automatic Gain Control) amplification factor calibration

allow. During calibration, a signal of known size is applied to the mobile station, and the mobile station reports RSSI.

The difference between the value and the true value is the AGC error. RSSI channel compensation calibration is to overcome frequency response

errors caused by the calibration. When calibrating, by inputting the same external signal on different channels

No., the mobile station uses the reported RSSI error as the compensation value of the RSSI of each channel.

5. Cellular OTAÿCellular Over

The Airÿ

This workstation is tested in Diags mode.

During the test, you need to insert the SIM card and set up

Call immediately. During testing, the PC sends commands to

CMW500 puts it in signaling state (simulating base station), and then sends a call command to IPAD to put it in

In the paging state, the sending instructions are binary data that comply with the relevant communication protocol. WF3 is mainly responsible for GSM,

CDMA2000, LTE transmission and reception. WF5 mainly assists CDMA2000 and LTE signal connection

receive. The transmitting part is mainly tested by testing the maximum transmit power, minimum transmit power, and average transmit power.

The transmission performance of the certified machine for GSM, UMTS, and CDMA2000 communication signals. The receiving part mainly passes

Test the receiving power of WF3 and WF5 to verify the UUT's ability to receive radio frequency communication signals.

(1) SIM Card (Subscriber Identify Module): GSM user identification module, inside

It has a microprocessor chip inside, also called a smart card. Each SIM card represents a user. GSM mobile phone users

A SIM card needs to be installed before it can be used. Call charges are automatically charged to the card user's account.

(2) Maximum transmit power (Max Transmit Power): Driven by continuous rising power control command

The dynamic UUT transmits the maximum power level. Does the UUT transmit the maximum power at the corresponding power level?

meet relevant requirements. Because the phone is constantly moving, the distance between the phone and the base station is constantly changing.

The transmit power of the mobile phone is not fixed, and the base station sends power level control to the mobile phone at different distances.

signal, the mobile phone will automatically adjust its own power after receiving the power level control signal, and transmit when it is far away from the base station.

The power is larger, and the transmitting power is smaller when it is close to the work station. The specific test process is: store in UUT memory

With the power control level table, when the UUT receives the power level request from the base station, the CPU controls

Next, the corresponding power level control data is retrieved from the power level control table and converted into a standard through digital-to-analog conversion.

power level value, and the actual transmit power of the mobile phone also becomes a corresponding level value after conversion.

The levels are compared to generate a power error control voltage to adjust the transmitter excitation amplifier circuit and preamplifier.

The amplification amount of the power amplifier circuit can adjust the UUT transmit power to the required power level.

Through receiving analysis, determine whether the power of the transmitted signal meets the requirements.

(3) Receiver bit error rate (BER): The receiver's performance under various input signal environments is determined by

Bit error rate representation. The receiving bit error rate refers to the data signal sent by the base station to the IPAD at a certain level.

After IPAD receives it, it demodulates and restores it, and then sends it to the base station. After the base station receives and demodulates it,

Compare it with the original data signal, and the difference between the two is the bit error. Expressed as a percentage, it is the bit error rate.

The main parameters to measure receiver performance are: frame erasure rate (FER), residual error bit rate (RBER)

and bit error rate are three parameters. When the error detection function in the receiver indicates that there is an error in a frame, the

Frames are defined as deleted, and the frame deletion rate refers to the ratio of the number of deleted frames to the total number of received frames. residual bits

The bit error rate is defined as the number of erroneous bits in those frames detected as good divided by the total number of bits transmitted in good frames

Number ratio. Bit error rate is defined as the ratio of received bits to transmitted data bits.

(4) International Mobile Identity (IMEI): The International Mobile Identity is used to uniquely identify a mobile phone.

The device code is a 17-digit decimal number.

Format: TAC FAC SNR SPN SVN

TAC (6 digits): Type Approval Code, assigned by the European Type Certification Center.

FAC (2 digits): Factory Assembly Code, indicating the manufacturer and assembly number.

SNR (6 digits): Serial Number, assigned by the manufacturer.

SPN (1 digit): Spare Number.

SVN (2 digits): Software Version Number software version number.

3.8. Other testing stations

6. Gate Keeper

During the access control test, after each work station is tested, the control bit corresponding to the work station will be written into

In MLB's memory. If the test is PASS, write P, if FAIL, write F, if the test is incomplete, write I.

(Incomplete), U (Un test) if not tested. During the test process, the memory is read through the test software.

The control bits written after each station test stored in the memory. If all are PASS, it means that the

All stations test normally. For those whose control bit is U or I, return to the corresponding station for testing. FAIL

Analyze and repair. Due to the influence of the test environment and test methods, the machine may have incorrect measurements. Apple

In order to prevent machines with unstable performance from leaking out, a program like this is set up in the testing software: continuous testing

After three FAIL attempts, the machine time is reset. This means that when the machine tests this station again, the test ends

The PDCA cannot be uploaded and the control bit cannot be written. This requires the use of the CBERASE instruction for a single

Clear the control bit of the work station and modify the time to the current time so that the machine can be retested.

This station. The FAIL machine in the production line needs to clear the FATP section station control bit after entering for maintenance.

7. Shipping Setting

Factory settings, clear previously downloaded test software, and download client software.

Screws and Location of Polar Light					
PL1	Location	Quantity	PL2&PL3	Location	Quantity
M1.2*2.3	MLB	1	M1.2*2.3	MLB	1
	Audio	2		Audio	2
	sensor board	5		sensor board	6
	power button	2		power button	2
	Volume	2		Volume button	2
M1.2*1.8	MLB	3	M1.2*1.8	MLB	6
	Home Button	2		Home Button	2
	back camera	2		back camera	2
M1.2*2.6	I/0 Flex	2	M1.2*2.6	I/0 Flex	2
M1.2*4.0	SPK	4	M1.2*4.0	SPK	4
M1.6*1.75	LCD	4	M1.6*1.75	LCD	4
M1.0*1.5	WF1	2	M1.0*1.5	WF1	2
M1.2*5.2	ringer button	1		SIM Tray	3
M1.2*1.55	WF1	1	M1.2*1.55	WF1	1
Difference between PL1 and PL2&3				WF2	1
1. Antenna: PL2&3:WF2,WF3&4,WF5				WF5	1
2. PL2&3: 3G module and SIM Tray				WF3/4	2
3.Sensor Chip:PL2&3. Proximity Chip			M1.2*5.2	ringer button	1